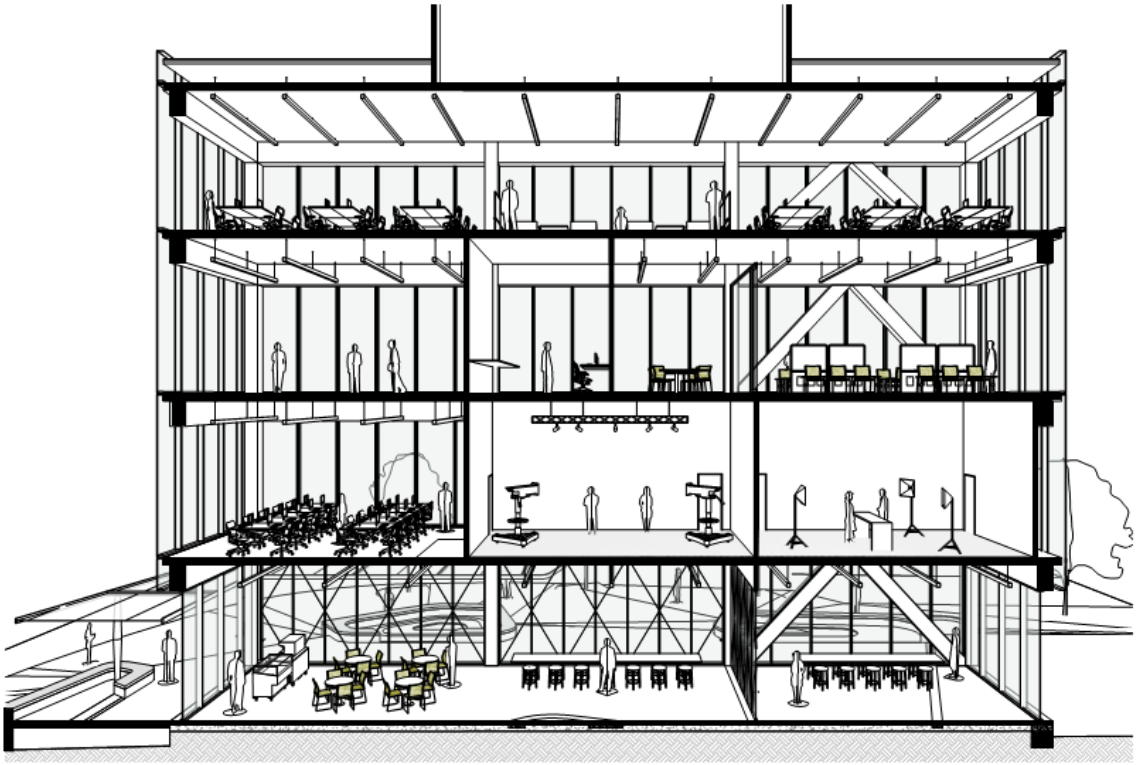
UNIVERSITY OF NEWCASTLE

UNIVERSITY OF NEWCASTLE - HONEYSUCKLE CITY CAMPUS DEVELOPMENT - STAGE 1A

SCHEMATIC DESIGN ESD REPORT

APRIL 2019



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University of Newcastle - Honeysuckle City Campus Development - Stage 1A Schematic Design ESD Report

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1 INTRODUCTION

WSP has been engaged to provide ecologically sustainable development (ESD) support and strategy for the University of Newcastle's Honeysuckle City Campus Development – Stage 1A, within the Honeysuckle precinct on Newcastle, NSW. This report summarises the recommended ESD strategy, and addresses the sustainability aspects of the proposed development at the schematic design stage.

The project is targeting mandatory and voluntary sustainability targets including:

- Compliance with National Construction Code (2016) Section J Energy Efficiency
- Green Building Council of Australia 5 Star Green Star rating under the Design and As Built tool V1.1
- Alignment with the University of Newcastle Draft Environmental Sustainability Plan 2018 - 2025

This report details the current design strategies to achieve these targets as well as addressing other holistic aspects of sustainability within the built environment. As the project moves into the detailed design phase, these strategies will develop further and may change as the building design progresses. Strategies cover the following sustainability areas:

- Management
- Indoor Environment Quality
- Passive Design
- Energy Efficiency
- Water Efficiency
- Materials
- Transport
- Biodiversity
- Emissions
- Innovation

This report demonstrates that there has been full consideration of matters of sustainability within the schematic design. It is expected that as the design progresses the strategies will be implemented during detailed design.

2 SUSTAINABILITY STRATEGY

The project will comply with the following mandatory sustainability requirements:

- National Construction Code (2016) Section J Energy Efficiency

The project is also targeting voluntary sustainability targets, including:

- Green Building Council of Australia 5 Star Green Star rating under the Design and As Built v1.1 tool
- Alignment with the University of Newcastle Draft Environmental Sustainability Plan2018 - 2025

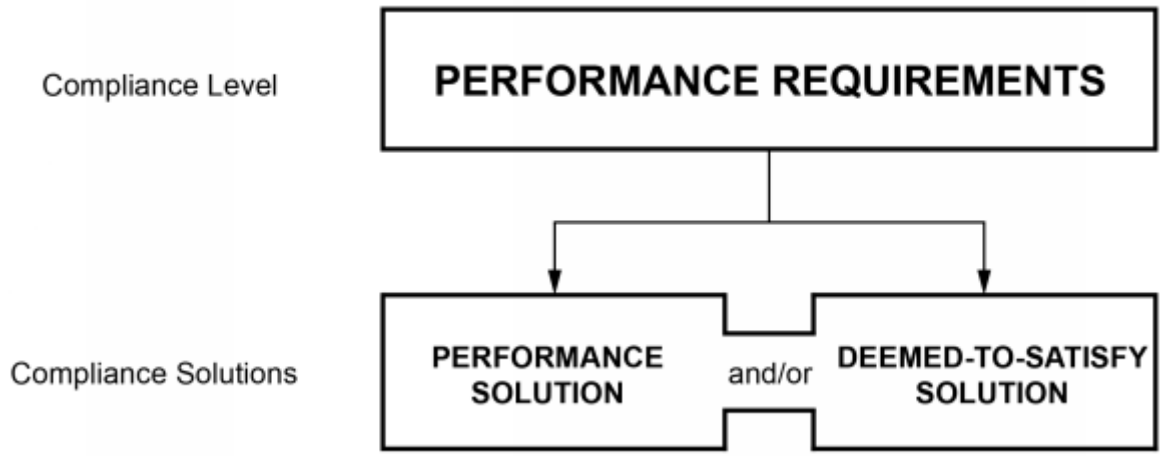
Through the above mandatory and voluntary sustainability targets and voluntary certification, the development will achieve Australian Excellence for sustainability performance within the built environment.

The following sections outline the proposed sustainability strategy for the project.

2.1 NATIONAL CONSTRUCTION CODE 2016 – SECTION J

The National Construction Code Section J Energy Efficiency is the minimum mandatory energy efficiency requirement for all buildings in Australia. The code allows for the performance requirements to be met through either compliance with the "Deemed to Satisfy" solution or a "Performance Solution" as per Figure 2.1.

Figure 2.1 Figure A0.2 from NCC 2016



The project is located within Climate Zone 5 – Mild temperate, and as such will require a balanced design to address both heating and cooling requirements of the development.

A strategy for compliance has been developed for the University of Newcastle's HCCD - Stage 1A development. The strategy includes achieving compliance through a Performance Solution (Verification Method JV3) rather than the prescriptive "Deemed to Satisfy" compliance pathway. Compliance strategy for each component of the NCC is presented below.

2.1.1 NCC PART J2 GLAZING

The development is taking a performance solution approach (Verification Method JV3). The strategy brings the following benefits to the project:

- Avoids the need to comply with onerous "Deemed to Satisfy" requirements;
- Provides more flexibility in glass type, glass system selection and design flexibility;
- Allows a consistent glass type to be used across the development, allowing the project to achieve its design intent; and,
- Results in a more energy efficient and optimized outcome compared with a "Deemed to Satisfy" building design.

The project includes large areas of glazing, and as such will provide a high-performance glazing product to ensure compliance is achieved. Currently, the project is anticipating an electrochromic glazed system to provide a high-performance solution that enables building occupant comfort, energy efficiency and increased visual amenity within the project (See Section 2.3.1 for further detail).

2.1.2 NCC PART J – ALL OTHER PARTS

All other parts of the NCC Section J will be addressed by the project team through a "Deemed to Satisfy" approach.

The final facade design will consider mechanical, acoustic, thermal and visual aspects of the design. This will be developed further during the detailed design phase of the project.

2.1.3 SUMMARY OF RESULTS

A preliminary NCC Section J report has been completed and is presented in Appendix A.

A summary of the reference and proposed building fabric is presented below in Table 2.1.

The BCA Section J1 Building Fabric and J2 Glazing assesses the building envelope only. Therefore, the following values are only applicable between typical conditioned spaces that adjoin an unconditioned space or the outside, where the building thermal envelope is defined.

Table 2.1: Building Fabric Thermal Performance Parameters

BUILDING FABRIC ELEMENT	REFERENCE BUILDING	PROPOSED BUILDING
Slab on ground	**None**	As Per the Reference building
External walls	**R 2.8 m².K/W**	
Envelope walls other than external walls	**R 1.0 m².K/W** – where the non-conditioned space has mechanical ventilation of not more than 1.5 air changes per hour of outside air per hour. **R 1.8 m².K/W** – where the non-conditioned space has mechanical ventilation of more than 1.5 air changes per hour of outside air during occupied hours.	
Ceilings to unconditioned areas	**R 3.2 m².K/W** Downwards.	

BUILDING FABRIC ELEMENT	REFERENCE BUILDING	PROPOSED BUILDING
Roof	**R 3.2 m².K/W** Downwards with solar absorptance of < 0.4	

A summary of the reference and proposed building glazing is presented below in Table 2.2.

Table 2.2: Proposed Building Glazing Parameters

ORIENTATION	LEVEL	REFERENCE BUILDING (Whole of System Values)	PROPOSED BUILDING (Whole of System Values)
All	All	Per the glazing calculators in **Error! Reference source not found.** Aluminum Frame	Suntuitive Starphire SN68 U-Value = 2.5, SHGC = 0.39* Aluminium Frame

*Note: Suntuitive Starphire SN68 is an electrochromic glazing product, which can be dynamically controlled to alter the SHGC between 0.39 and 0.17. For compliance purposes, a conservative approach has been taken, and the glass has been modelled without electrochromic function operating, ie with the SHGC static at 0.39.

2.2 GREEN STAR

The University of Newcastle's HCCD - Stage 1A development project will target a 5 Star rating under the Green Building Council of Australia's Green Star Design and As Built V1.1 rating tool. This target demonstrates Australian Excellence in sustainability and is ambitious for a project of this size and location. Initial analysis, modelling, design and planning for the rating has been undertaken, ensuring the target is achievable and embedded within the design of the project.

The points pathway attached within Appendix B details the approach to be undertaken in achieving the 5 Star Green Star rating for the development. This summary presents the current approach to achieving a 5 Star Green Star rating, it is acknowledged that strategies change during design development and construction, and as such, the final pathway to achieving the 5 Star rating may differ from the current strategy, however the Project team are committed to achieving a 5 Star Green Star Rating.

2.2.1 APPROACH TO 5 STAR RATING

The 5 Star Green Star pathway includes initiatives targeted under the following categories

MANAGEMENT

- 1.0 Green Star Accredited professional
- 2.0 Environmental performance targets
- 2.1 Services and maintainability review
- 2.2 Building commissioning
- 2.3 Building system tuning
- 2.4 Independent commissioning agent
- 4.1 Building O&M Information
- 4.2 Building user information
- 5.1 Environmental Building Performance
- 5.2 End of Life Waste Performance
- 6.0 Metering
- 6.1 Monitoring Systems
- 7.0 Environmental Management Plan

- 7. 1Formalised Environmental Management System
- 8 Operational Waste

INDOOR ENVIRONMENT QUALITY

- 9.1 Ventilation System Attributes
- 9.2 Provision of Outdoor Air
- 9.3 Exhaust or Elimination of Pollutants
- 10.1 Internal Noise Levels
- 10.3 Acoustic Separation
- 11.0 Minimum Lighting Comfort
- 11.1 General Illuminance and Glare Reduction
- 11.2 Surface Illuminance
- 11.3 Localised Lighting Control
- 12.0 Glare Reduction
- 12.1 Daylight
- 12.2 Views
- 13.1 Paints, Adhesives, Sealants and Carpets
- 13.2 Engineered Wood Products
- 14.1 Thermal Comfort

ENERGY

- 15E.1 Greenhouse Gas Emissions – Comparison to a reference building
- 16B Peak Electricity Demand Reduction

TRANSPORT

- 17B.1 Access by Public Transport
- 17B.5 Walkable Neighbourhoods

WATER

- 18A.1 Potable Water – Performance Pathway

MATERIALS

- 19B.1 Concrete
- 19B.2 Steel
- 20.1 Structural and Reinforcing Steel
- 20.2 Timber Products
- 20.3 Permanent formwork, pipes, flooring, blinds and cables
- 21.1 Product Transparency and Sustainability
- 22B Construction and demolition Waste

LANDUSE AND ECOLOGY

- 23.0 Endangered, Threatened or Vulnerable Species
- 23.1 Ecological Value
- 24.1 Reuse of land
- 25.0 Heat Island Effect Reduction

EMISSIONS

- 26.1 Stormwater Peak Discharge
- 26.2 Stormwater Pollution Targets
- 27.0 Light Pollution to Neighbouring Bodies
- 27.1 Light Pollution to Night Sky
- 29.0 Refrigerant Impacts

2.2.2 INNOVATION

Green Star allows for up to 10 points to be achieved under the innovation category. A final innovation strategy will be determined during detailed design, however the project team will target all 10 available points. The following are currently under consideration:

- Innovative Technology or Process – Rooftop PV
- Financial Transparency
- Community Benefits
- Air tightness testing (Performance achieved)
- Marketing Excellence
- Occupant Engagement
- Reconciliation Action
- Social Return on Investment
- Local Procurement
- Universal Design
- Student sustainability education programmes within building
- Any other sustainability technology with environmental, or social benefits
- Contractor Education
- Energy Metering Integrity

2.2.3 6 STAR STRATEGY

The University of Newcastle brief called for a minimum 5 Star Green Star Rating. The Latest University of Newcastle Draft Environmental Sustainability Plan 2018 – 2025 includes formal endorsement for a minimum 6 Star Green Star Rating on all new projects.

WSP have provided a stretch pathway to achieve a 6 Star Green Star Rating, presented in Appendix C, identifying the additional works that need to be considered to achieve a 6 Star Rating.

The project team will progress pursuing a 5 Star Green Star Strategy unless directed otherwise.

2.3 OTHER INITIATIVES

2.3.1 ELECTROCHROMIC GLAZING

Electrochromic glazing has been proposed within the HCCD - Stage 1A development as an innovative feature to address matters of sustainability within the façade design. The glazing is currently proposed on the western façade.

Electrochromic glazing is an electronically tintable glazing solution that provides the ability to adjust the transparency and solar heat gain coefficient of the glazing to control the heat and visual light transmittance, and henceglare experienced within the building. This function allows increased occupant comfort, maximised access to daylight and external views and reduced energy consumption.

It is recommended that radiation sensors be utilised alongside this technology to enable an automated response to solar radiation experienced upon the façade, ensuring that the glazing is operating at optimised performance levels thermally.

The system can be controlled manually for special events or via other sensors connected to the BMS.

Further detail surrounding the proposed system and required performance parameters have been detailed within Appendix A.

2.3.2 POTABLE WATER

The water consumption of the development has been estimated through the use of the Green Star 'Potable Water Calculator' and has identified that the proposed design presently achieves water efficiency in comparison to a 'best practice' benchmark through the use of water efficient fixtures/fittings and a rainwater capture system as detailed below and within the full calculator attached within Appendix C:

FITTINGS AND FIXTURES

The proposed fittings and fixtures utilised within this potable water calculator are detailed within Table 2.3 below;

Table 2.3 Proposed Fittings and Fixtures*

	RATING
Toilets	4 Stars
Urinals	6 Stars
Indoor Taps	6 Stars
Dishwashers	5 Stars

*Showers and any additional whitegoods expected to consume water have been excluded from this calculation and will need to be incorporated if included within future design decisions.

RAINWATER COLLECTION

A 20KL rain water tank has been proposed within the design to capture rainwater and service the potable water demands of the proposed development. The rainwater collection system collects water from the entire roof, stores water in the 20KL rainwater tank and supplies water to toilets and urinals.

IRRIGATION

All landscaping shall be native, waterless type, removing any need for an irrigation system

2.3.3 GROUND FLOOR MIXED MODE OPERATION

The proposed design includes a mixed mode ground floor operation. The mixed mode operation will operate when large doors are opened on ground floor for major events.

The mixed mode will work by firstly operating in full natural ventilation mode, with outside air passing through the large doors and louvres to the south of the ground floor. If conditions are too warm, the air conditioning system will operate in 100% economy mode to provide cooler outside air and encourage air movement in the space. ceiling fans can be considered to further improve mixed mode comfort conditions

2.3.4 ROOFTOP PV SYSTEM

The energy strategy for the building relies heavily on a high capacity, high efficiency rooftop PV system. As much PV as possible should be placed on the roof for maximum generation and in line with University of Newcastle's current aspirations for carbon reductions. The following system type should be achievable

SYSTEM DETAILS	
Panel Capacity	365W
Number of Panels	270
System Area	459m2
System Capacity	98.5kW
Manufacturer	LG
Make	NeonR
Estimated Generation	1.1 – 1.4 MWh
Manufacturer Warranty	25 Years
Performance Warranty	25 Years

3 CONCLUSION

WSP have identified and assessed the University of Newcastle's HCCD - Stage 1A development against the projects targeted mandatory and voluntary sustainability targets. A sustainability strategy has been developed to address the requirements of these targets in the design phase of the project. The identified targets include:

- National Construction Code 2016, Part J Energy Efficiency
- Green Star Design and As Built 5 Star Rating

This report demonstrates that sustainability initiatives have driven design decisions within the schematic design phase of the development and that the proposed development is on path to demonstrate Australian excellence within sustainable building design. It is expected that as the design progresses the strategies will be implemented during detailed design.

APPENDIX A

NCC 2016 - SECTION J REPORT

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NCC SECTION J REPORT: JV3

THE UNIVERSITY OF NEWCASTLE - HONEYSUCKLE CITY CAMPUS DEVELOPMENT - STAGE 1A

JANUARY 2019

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NCC Section J Report: JV3

The University of Newcastle - Honeysuckle City Campus Development - Stage 1A

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EXECUTIVE SUMMARY

WSP has been engaged by EJE Architecture to carry out a Performance Solution assessment of the building envelope using Verification Method JV3 under Section J Energy Efficiency, Volume 1 of the National Construction Code (NCC) 2016 for the building envelope performance requirements of the Honeysuckle City Campus Development (HCCD) Stage 1A of the University of Newcastle, located at Honeysuckle Drive, Newcastle, NSW.

Verification Method JV3 requires a comparison between a Reference Building – constructed in accordance with the deemed-to-satisfy (DTS) provisions detailed in the Parts of Section J – and the Proposed Building – constructed in accordance with the design intent.

The following simulations have been carried out:

- Reference Building + Reference Services – modelling of the building with the building envelope and services meeting the DTS provisions
- Proposed Building + Reference Services – modelling of the building with the building envelope meeting the design intent and the services meeting the DTS provisions

Table 1.1 and Figure 1.1 demonstrate the predicted annual energy consumption for the simulations performed.

Based on the modelling performed, the proposed building envelope is deemed to comply with the performance requirements. The calculated annual energy consumption of the Proposed Building is less than the Reference Building.

Table 1.1 Simulation Results

BUILDING	ANNUAL ENERGY CONSUMPTION (MWH/YEAR)						
	Heating	Cooling	Auxiliary	Equipment	Lighting	**Total**	**Pass/Fail**
Reference Building + Reference Services	51.17	102.43	84.36	27.59	57.52	**323.08**	
Proposed Building + Reference Services	36.03	112.79	87.98	27.59	57.52	**321.93**	**0.36% Improvement**

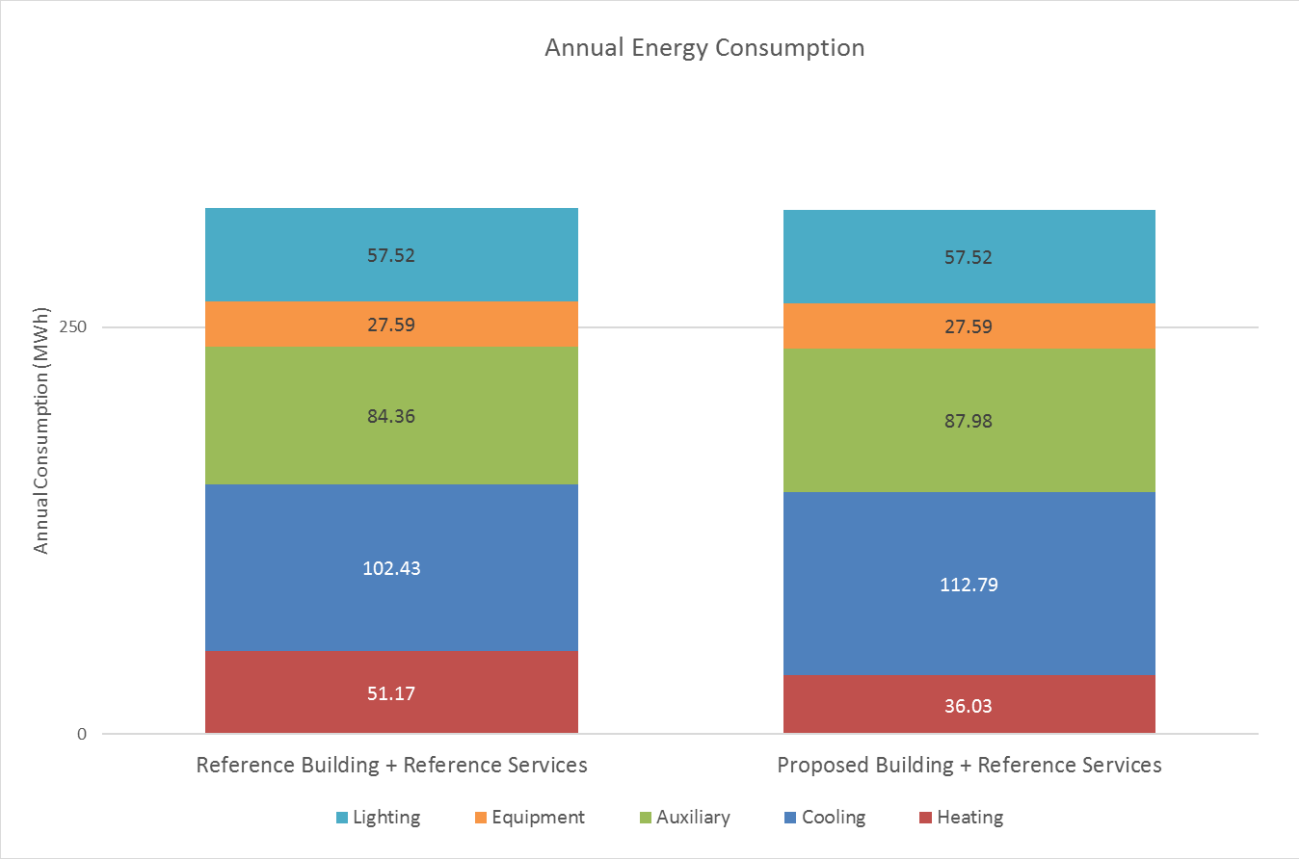

Figure 1.1 Simulation Results

1 INTRODUCTION

1.1 PURPOSE OF REPORT

WSP has been engaged by EJE Architecture to carry out a Performance Solution assessment of the building envelope using Verification Method JV3 under Section J Energy Efficiency, Volume 1 of the National Construction Code (NCC) 2016 for the building envelope performance requirements of the Honeysuckle City Campus Development (HCCD) Stage 1A of the University of Newcastle, located at Honeysuckle Drive, Newcastle, NSW.

Verification Method JV3 requires a comparison between a Reference Building – constructed in accordance with the deemed-to-satisfy (DTS) provisions detailed in the Parts of Section J – and the Proposed Building – constructed in accordance with the design intent. The following simulations have been carried out:

- Reference Building + Reference Services—modelling of the building with the building envelope and services meeting the DTS provisions
- Proposed Building + Reference Services—modelling of the building with the building envelope meeting the design intent and the services meeting the DTS provisions

This report presents the methodology used for the JV3 modelling and the results of the simulations undertaken.

1.2 PERFORMANCE REQUIREMENTS

Volume One of the NCC Series 2016 Clause A0.7 Requirements

The relevant DTS Provisions considered in the Reference Building and the Proposed Building are as follows:

- Section J Part J0 Energy Efficiency
- Section J Part J1 Building Fabric
- Section J Part J2 Glazing
- Section J Part J3 Building Sealing
- Section J Part J5 Air Conditioning and Ventilation System
- Section J Part J6 Artificial Lighting and Power

There are no performance requirements from other Sections or Parts of Volume One of the NCC Series 2016 that are relevant to any aspects of the Reference Building and the Proposed Building or that are affected by the application of the DTS provisions that are the subject of the Reference Building and the Proposed Building.

Volume One of the NCC Series 2016 JP1 Requirements

A building, including its services, must have, to the degree necessary, features that facilitate the efficient use of energy appropriate to:

- The function and use of the building and its services
- The internal environment
- The geographic location of the building
- The effects of nearby permanent features such as topography, structures and buildings
- Solar radiation being utilised for heating and controlled to minimise energy for cooling
- The sealing of the building envelope against air leakage
- The utilisation of air movement to assist heating and cooling
- The energy source of the services

2 METHODOLOGY

2.1 ASSESSMENT METHOD AND BUILDING CLASSIFICATION

Clause A0.5 of Volume One of the NCC Series 2016 stipulates that the following assessment methods, or any combination of them, can be used to determine that a building solution complies with the performance requirements:

- Evidence to support that the use of a material, form of construction or design meets a Performance Requirement or a Deemed-to-Satisfy provision as described in A2.2
- Verification Methods such as the Verification Methods in the NCC; or such other Verification Methods as the appropriate authority accepts for determining compliance with the Performance Requirements
- Expert judgement
- Comparison with the Deemed-to-Satisfy provisions

The development seeks to demonstrate compliance with JP1 by using:

- Evidence to support that the use of a material, form of construction or design meets a Performance Requirement or a Deemed-to-Satisfy provision as described in A2.2
- Verification Method JV3; determining that the annual energy consumption of the Proposed Building is not more than the annual energy consumption of the Reference Building for the school development.

In accordance with Part A3.2 of NCC Volume 1, the proposed building comprises spaces with the following classification:

- Class 9b

The site is located within Climate Zone 5.

2.2 MODEL INFORMATION

2.2.1 SOFTWARE

The computer package used for the thermal simulation was Virtual Environment version 2018 by Integrated Environmental Solutions. It is an EN ISO 13791 validated dynamic simulation modelling (DSM) software tool and is approved under the *ABCB Protocol for Building Energy Analysis Software*, *Version 2006.1*.

2.2.2 SOURCES OF INFORMATION

The following sources of information were used to generate the thermal model:

- Parts J1 – J3, Section J, Volume One of the NCC Series 2016
- Australian Building Codes Board (ABCB) glazing calculator 2014 (current version)
- Glazing candidates: data from Suntuitive 'Technical Information' data sheet
- Architectural drawings: EJE Architecture 'HCCD Stage 1A' dated December 2018 , Revision B.

2.2.3 EQUIPMENT LOADS

The simulations apply the following air conditioning parameters, per Volume One of the NCC Series 2016, including:

- Specification JV Table 2g for the appliances and equipment schedule
- Specification JV Table 2h for equipment loads

2.2.4 MECHANICAL SERVICES

The simulations apply the following air conditioning parameters, as per Volume One of the NCC Series 2016, including:

- Specification JV Table 2g for the air conditioning operational schedule
- Clause JV3 (d), sub clause (i) (D) for the air conditioning temperature range
- Maximum fan motor power, as per Specification J5.2, Table J5.2
- Minimum EER for heat pump, as per Table 2b in Specification J5.2e

2.2.5 OCCUPANCY LOADS

The simulations apply the following air conditioning parameters, as per Volume One of the NCC Series 2016, including:

- Specification JV Table 2g for the occupancy schedule
- Specification JV, Table 2j, other applications (a) for sensible and latent occupancy heat gain
- Table D1.13 for occupant density

2.2.6 LIGHTING LOADS

The simulations apply the following air conditioning parameters, as per Volume One of the NCC Series 2016, including:

- Specification JV Table 2g for artificial lighting schedule
- Table J6.2a for maximum illumination power density

3 BUILDING FABRIC PERFORMANCE PARAMETERS

This section summarises the building fabric as modelled for the JV3 analysis. It details changes to the building elements currently specified to achieve compliance.Table 3.1 lists the building fabric performance parameters used in the reference and the proposed building. The R-value listed shows the total system R-value, see Table 3.1 for drawings showing where the total construction values need to be applied. The markup of Appendix A reflects the parameters used for the modeling.

The BCA Section J1 Building Fabric and J2 Glazing assesses the building envelope only. Therefore, the following values are only applicable between typical conditioned spaces that adjoin an unconditioned space or the outside, where the building thermal envelope is defined.

Table 3.1: Building Fabric Thermal Performance Parameters

BUILDING FABRIC ELEMENT	REFERENCE BUILDING	PROPOSED BUILDING
Slab on ground	**None**	As Per the Reference building
External walls	**R 2.8 m².K/W**	
Envelope walls other than external walls	**R 1.0 m².K/W** – where the non-conditioned space has mechanical ventilation of not more than 1.5 air changes per hour of outside air per hour. **R 1.8 m².K/W** – where the non-conditioned space has mechanical ventilation of more than 1.5 air changes per hour of outside air during occupied hours.	
Ceilings to unconditioned areas	**R 3.2 m².K/W** Downwards.	
Roof	**R 3.2 m².K/W** Downwards with solar absorptance of < 0.4	

4 BUILDING GLAZING PERFORMANCE PARAMETERS

The reference building glazing is developed in compliance with the National Construction Code Glazing Calculators (Volume One) using available glazing products.

Refer to Appendix A for the completed Glazing Calculators, Appendix B for the building fabric markups and Table 4.1 which summarises the glazing parameters used for the proposed building in the JV3 analysis.

Table 4.1: Proposed Building Glazing Parameters

ORIENTATION	LEVEL	REFERENCE BUILDING (Whole of System Values)	PROPOSED BUILDING (Whole of System Values)
All	All	Per the glazing calculators in Appendix A Aluminum Frame	Suntuitive Starphire SN68 U-Value = 2.4, SHGC = 0.39* Aluminium Frame

*Note: Suntuitive Starphire SN68 is an electrochromic glazing product, which can be dynamically controlled to alter the SHGC between 0.39 and 0.17. For compliance purposes, a conservative approach has been taken, and the glass has been modelled without electrochromic function operating, ie with the SHGC static at 0.39.

5 RESULTS

The following simulations have been carried out:

- Reference Building + Reference Services—modelling of the building with the building envelope and services meeting the DTS provisions.
- Proposed Building + Reference Services—modelling of the building with the building envelope meeting the design intent and the services meeting the DTS provisions.

Table 5.1 and Figure 5.1 demonstrate the predicted annual energy consumption for the simulations performed.

Based on the modelling performed, the proposed building envelope is deemed to comply with the performance requirements. The calculated annual energy consumption of the **Proposed Building is 0.36%** less than the Reference Building.

Table 5.1 Simulation Results

BUILDING	ANNUAL ENERGY CONSUMPTION (MWH/YEAR)						
	Heating	Cooling	Auxiliary	Equipment	Lighting	**Total**	**Pass/Fail**
Reference Building + Reference Services	51.17	102.43	84.36	27.59	57.52	**323.08**	
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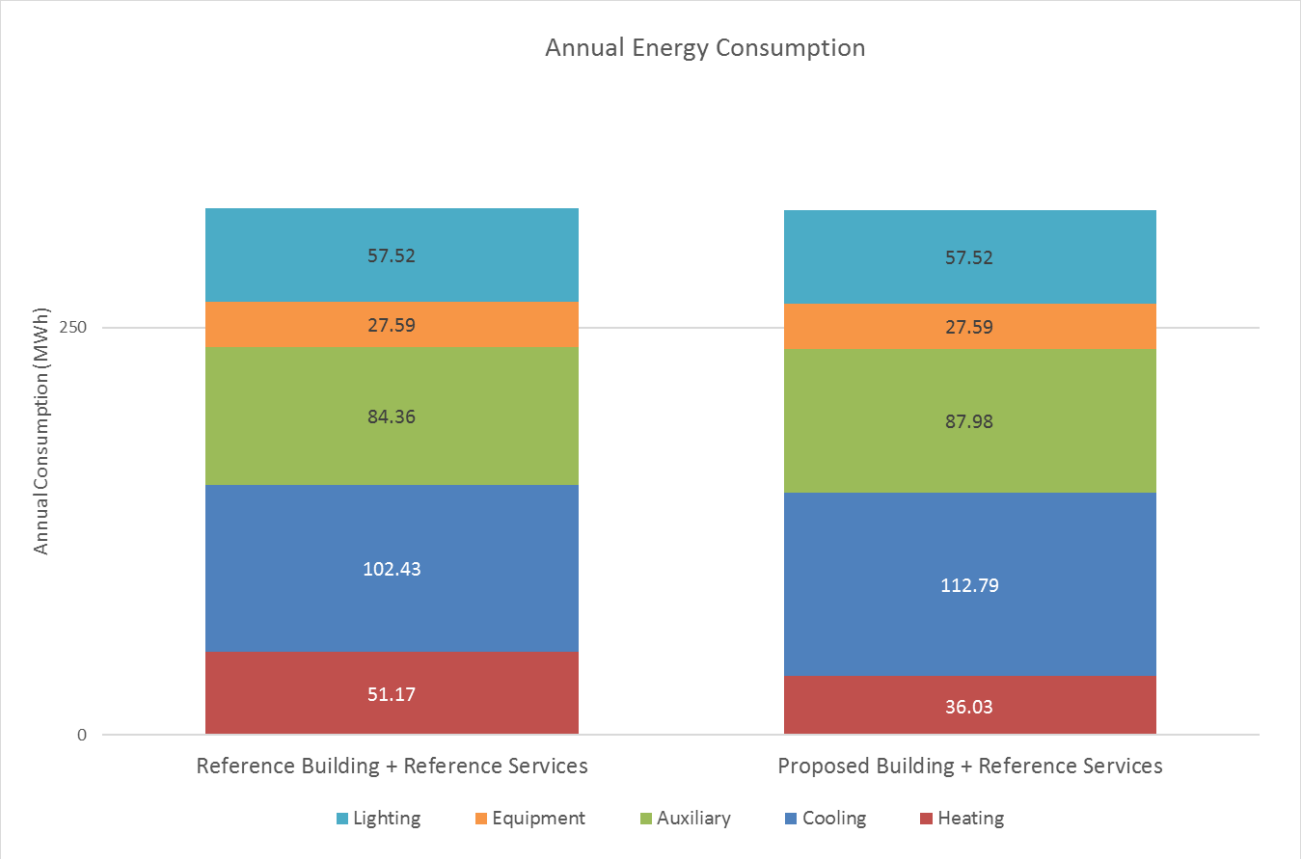

Figure 5.1 Simulation Results

APPENDIX A

COMPLIANT GLAZING CALCULATORS

NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description: **UoN Innovation Hub**

Application: **other**

Climate zone: **5**

Storey: **GF**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	136m²		67m²		54m²		121m²		
Option B									n/a
Glazing area (A)	*126m²*	……	*27m²*	……	*43m²*	……	*108m²*		

Number of rows preferred in table below **8** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
	Northern	N		5.00	25.20		8.0	0.29	0.600	4.000	0.15	-1.00	0.97	0.86	126.00	100% of 99%
											ROW SKIPPED (OK if intentional)					
	Eastern	E		5.00	5.40		8.0	0.44	0.800	4.000	0.20	-1.00	0.92	0.87	27.00	100% of 100%
											ROW SKIPPED (OK if intentional)					
	Southern	S		5.00	8.60		3.9	0.80	0.800	4.000	0.20	-1.00	0.94	0.90	43.00	100% of 98%
											ROW SKIPPED (OK if intentional)					
	Western	W		5.00	21.60		2.9	0.18	0.600	4.000	0.15	-1.00	0.94	0.90	108.00	100% of 100%

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NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description: **UoN Innovation Hub**

Application: **other**

Climate zone: **5**

Storey: **L1**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	140m²		90.5m²		48m²		124m²		
Option B									n/a
Glazing area (A)	*140m²*	.....	*38.1m²*	.....	*48m²*	.....	*124m²*		

Number of rows preferred in table below **8** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
	Northern	N		5.00	27.90		8.0	0.23				0.00	1.00	1.00	139.50	100% of 93%
											ROW SKIPPED (OK if intentional)					
	Eastern	E		5.00	6.50		8.0	0.36				0.00	1.00	1.00	32.50	85% of 99%
		E		4.00	1.40		8.0	0.36				0.00	1.00	1.00	5.60	15% of 99%
											ROW SKIPPED (OK if intentional)					
	Southern	S		5.00	9.60		3.1	0.80				0.00	1.00	1.00	48.00	100% of 97%
											ROW SKIPPED (OK if intentional)					
	Western	W		5.00	24.80		2.3	0.15				0.00	1.00	1.00	124.00	100% of 100%

if inputs are valid

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NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description: **UoN Innovation Hub**

Application: **other**

Climate zone: **5**

Storey: **L2**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	140m²		90.5m²		48m²		124m²		
Option B									n/a
Glazing area (A)	*140m²*	.....	*43.7m²*	.....	*48m²*	.....	*124m²*		

Number of rows preferred in table below **8** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
	Northern	N		5.00	27.90		8.0	0.23				0.00	1.00	1.00	139.50	100% of 93%
											ROW SKIPPED (OK if intentional)					
	Eastern	E		5.00	6.50		8.0	0.31				0.00	1.00	1.00	32.50	74% of 98%
		E		4.00	2.80		8.0	0.31				0.00	1.00	1.00	11.20	26% of 98%
											ROW SKIPPED (OK if intentional)					
	Southern	S		5.00	9.60		3.1	0.80				0.00	1.00	1.00	48.00	100% of 97%
											ROW SKIPPED (OK if intentional)					
	Western	W		5.00	24.80		2.3	0.15				0.00	1.00	1.00	124.00	100% of 100%

if inputs are valid

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NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description: **UoN Innovation Hub**

Application: **other**

Climate zone: **5**

Storey: **L3**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	126m²		112m²		71.1m²		112m²		
Option B									n/a
Glazing area (A)	*126m²*	……	*43.3m²*	……	*56.4m²*	……	*112m²*		

Number of rows preferred in table below **9** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
	Northern	N		4.50	27.90		8.0	0.23				0.00	1.00	1.00	125.55	100% of 93%
											ROW SKIPPED (OK if intentional)					
	Eastern	E		4.50	6.50		8.0	0.39				0.00	1.00	1.00	29.25	68% of 99%
		E		4.00	3.50		8.0	0.39				0.00	1.00	1.00	14.00	32% of 99%
											ROW SKIPPED (OK if intentional)					
	Southern - Seminar	S		4.50	9.60		3.8	0.80				0.00	1.00	1.00	43.20	77% of 99%
	Southern - Kitchen	S		3.00	4.40		3.8	0.80				0.00	1.00	1.00	13.20	23% of 99%
											ROW SKIPPED (OK if intentional)					
	Western	W		4.50	24.80		2.8	0.14				0.00	1.00	1.00	111.60	100% of 100%

if inputs are valid

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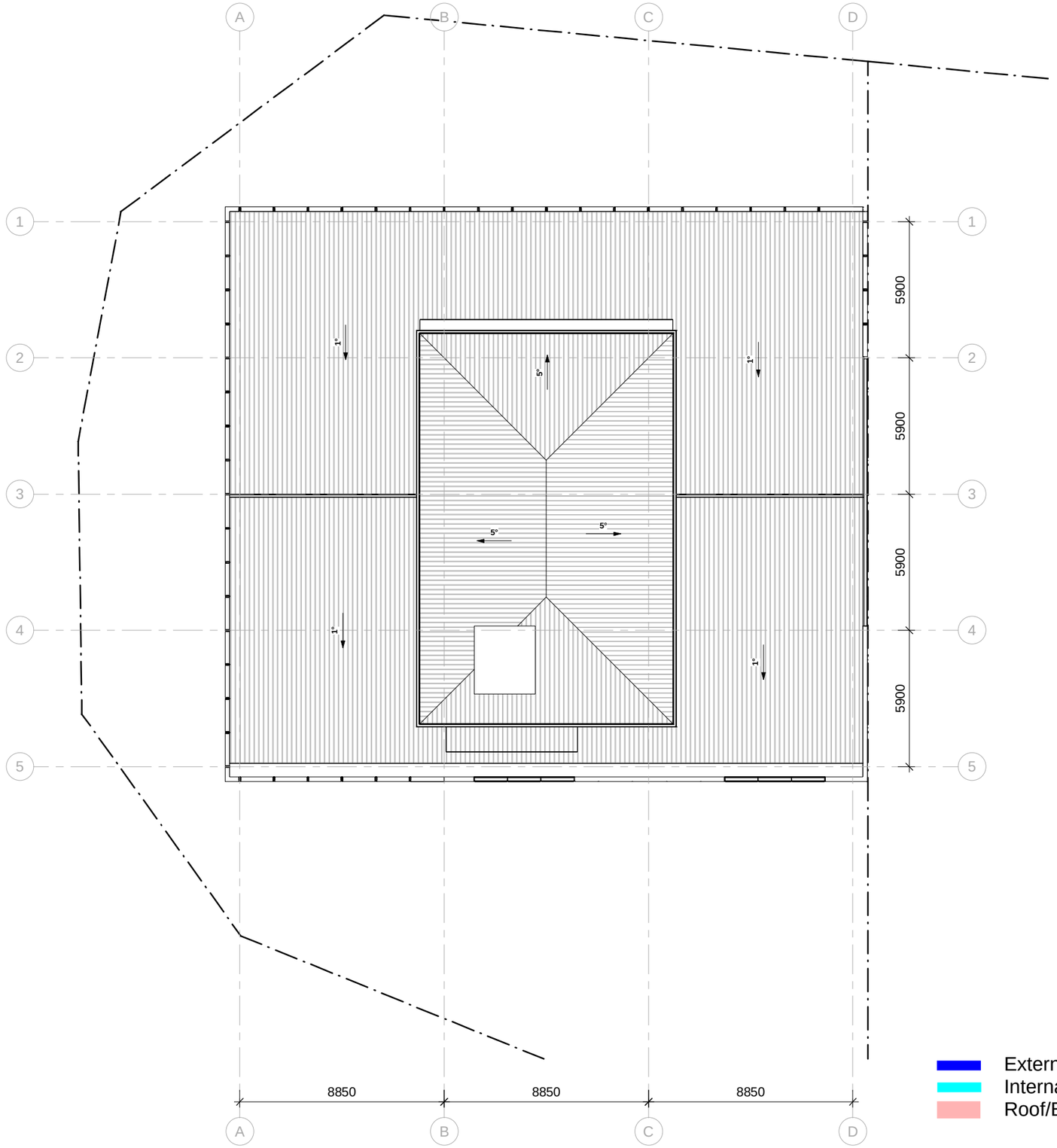
APPENDIX B

BUILDING FABRIC MARKUPS



External Envelope Wall - total R value R2.8
Internal Envelope Wall - total R value R1.8
Roof/Exposed Ceiling - total R value R3.2

EJE ARCHITECTURE
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0 25mm 100mm 200mm ON ORIGINAL A1

REV	DATE	COMMENTS
A	2018/12/12	ISSUE FOR SCHEMATIC DESIGN
B	2019/01/18	ISSUE FOR SCHEMATIC DESIGN

DRN	CHKD	VRFD
NJH/JE	AKF	
JE	AKF	

PROJECT : HCCD STAGE 1A

CLIENT : UNIVERSITY OF NEWCASTLE

SITE : 16B HONEYSUCKLE DRIVE NEWCASTLE, NSW, 2300

DRAWING : ROOF PLAN

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

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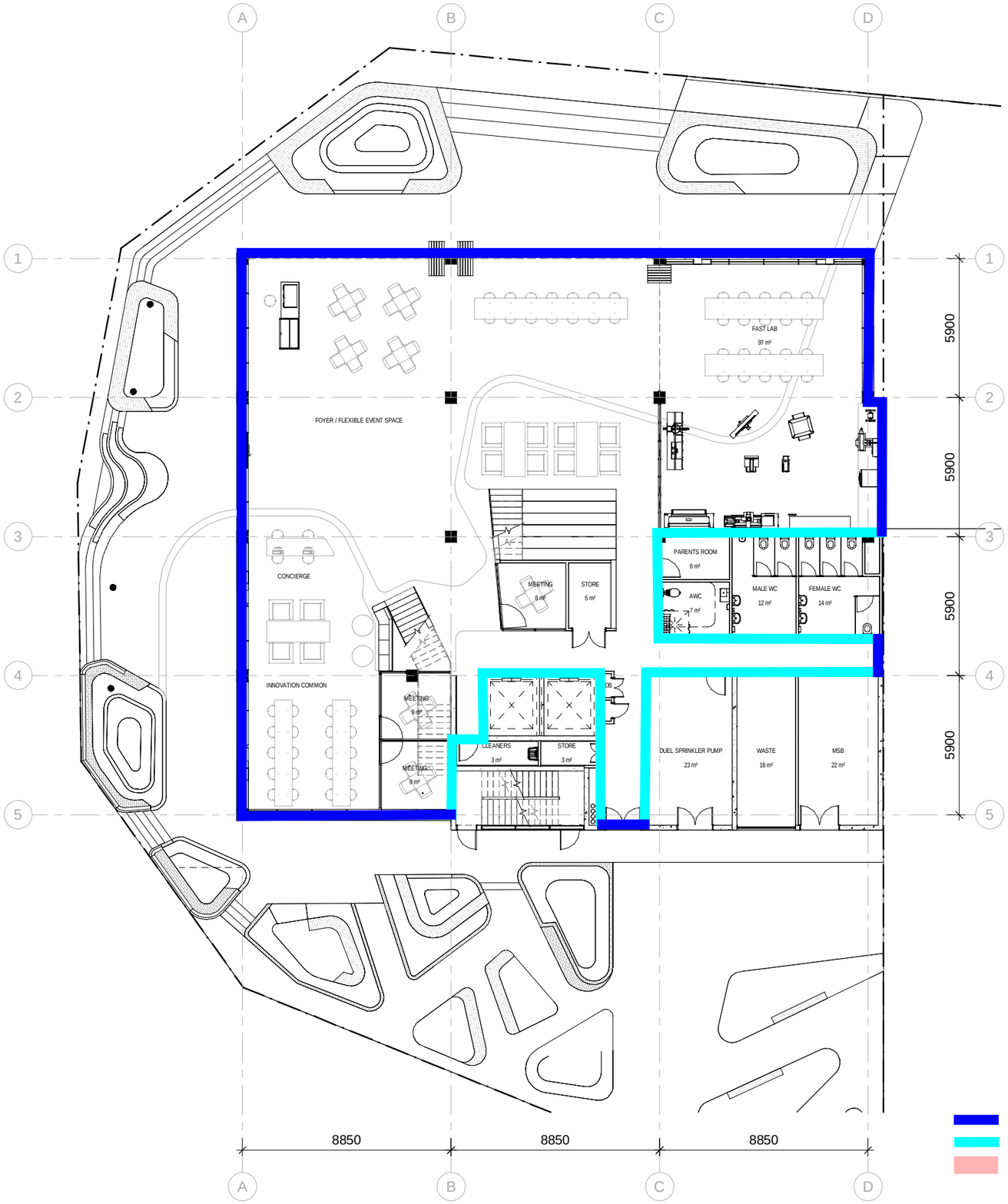
DATE : NJH DEC 2018

SCALES : 1 : 100 @ A1, 1 : 200 @ A3

PROJECT No :	PHASE :	DRAWING No :	REV :
11749	SD	A-107	B

EJE architecture



External Envelope Wall - total R value R2.8
Internal Envelope Wall - total R value R1.8
Roof/Exposed Ceiling - total R value R3.2

EJE ARCHITECTURE
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0 20mm 100mm 200mm ON ORIGINAL A1

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D	2018/10/04	ISSUE FOR REVIEW
E	2018/10/08	ISSUE FOR REVIEW
F	2018/10/18	ISSUE FOR REVIEW
G	2018/10/30	ISSUE FOR REVIEW
H	2018/11/14	ISSUE FOR REVIEW
J	2018/11/22	ISSUE FOR REVIEW
K	2018/12/10	ISSUE FOR REVIEW
L	2018/12/12	ISSUE FOR SCHEMATIC DESIGN
M	2019/01/18	ISSUE FOR SCHEMATIC DESIGN

DRN	CHKD	VRFD
NJH	AKF	
NJH	AKF	
NJH	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
NJH/JE	AKF	
JE	AKF	

PROJECT : HCCD STAGE 1A

CLIENT : UNIVERSITY OF NEWCASTLE

SITE : 16B HONEYSUCKLE DRIVE NEWCASTLE, NSW, 2300

DRAWING : GROUND FLOOR PLAN

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

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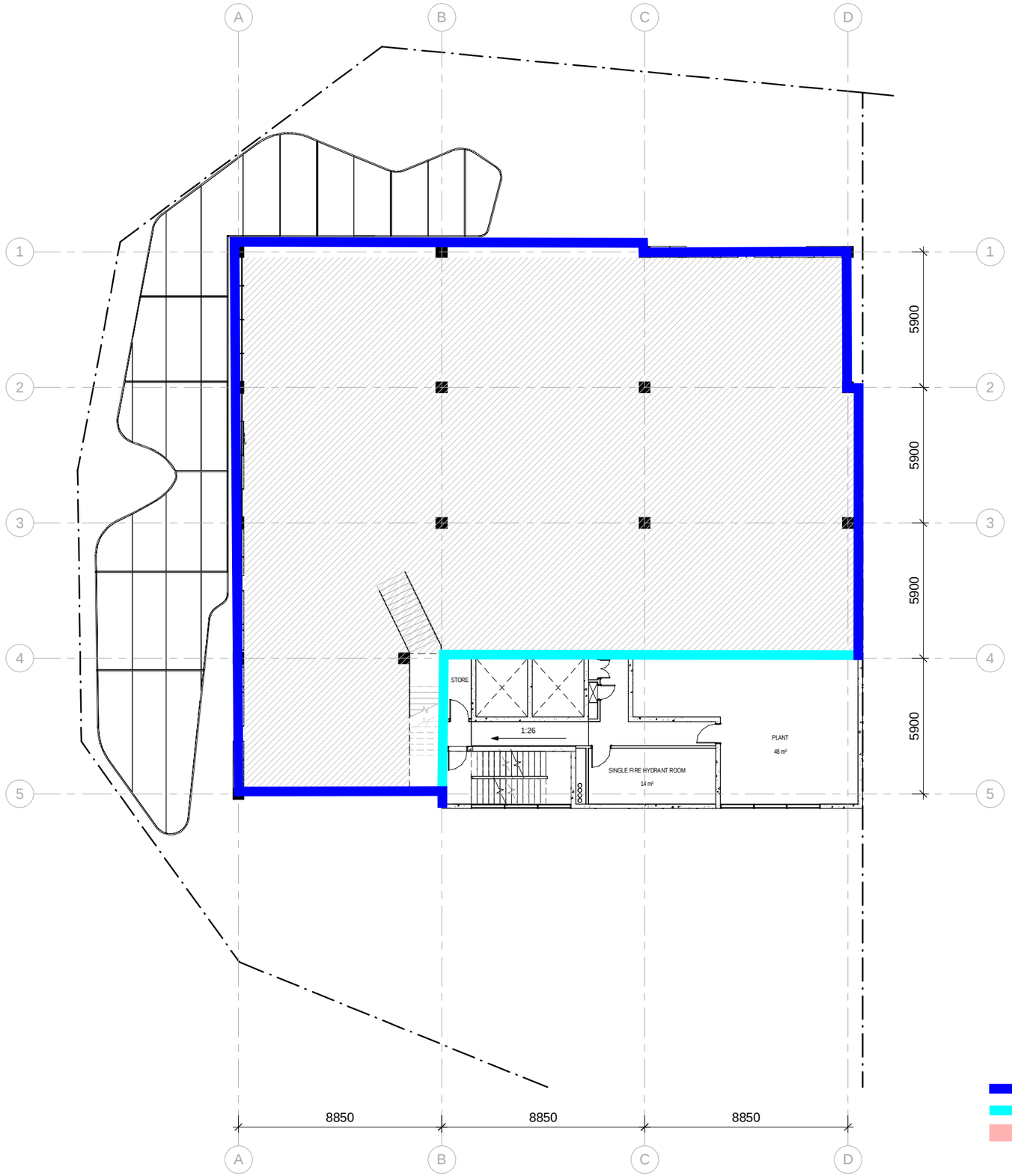
DRAWN : NJH
DATE : SEP 2018
SCALES : 1 : 100 @ A1, 1 : 200 @ A3

PROJECT No : 11749
PHASE : SD
DRAWING No : A-100
REV : M

EJE architecture



External Envelope Wall - total R value R2.8
Internal Envelope Wall - total R value R1.8
Roof/Exposed Ceiling - total R value R3.2

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C	2018/11/22	ISSUE FOR REVIEW
D	2018/12/10	ISSUE FOR REVIEW
E	2018/12/12	ISSUE FOR SCHEMATIC DESIGN
F	2019/01/18	ISSUE FOR SCHEMATIC DESIGN

DRN	CHKD	VRFD
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
NJH/JE	AKF	
JE	AKF	

PROJECT : HCCD STAGE 1A

CLIENT : UNIVERSITY OF NEWCASTLE

SITE : 16B HONEYSUCKLE DRIVE NEWCASTLE, NSW, 2300

DRAWING : MEZZANINE PLAN

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

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DRAWN : JE
DATE : OCT 2018
SCALES : 1 : 100 @ A1, 1 : 200 @ A3

PROJECT No :	PHASE :	DRAWING No :	REV :
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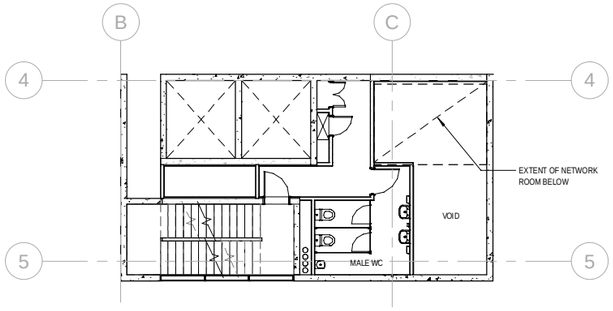
EJE architecture



2 LEVEL 1 MEZZANINE - MALE W/C

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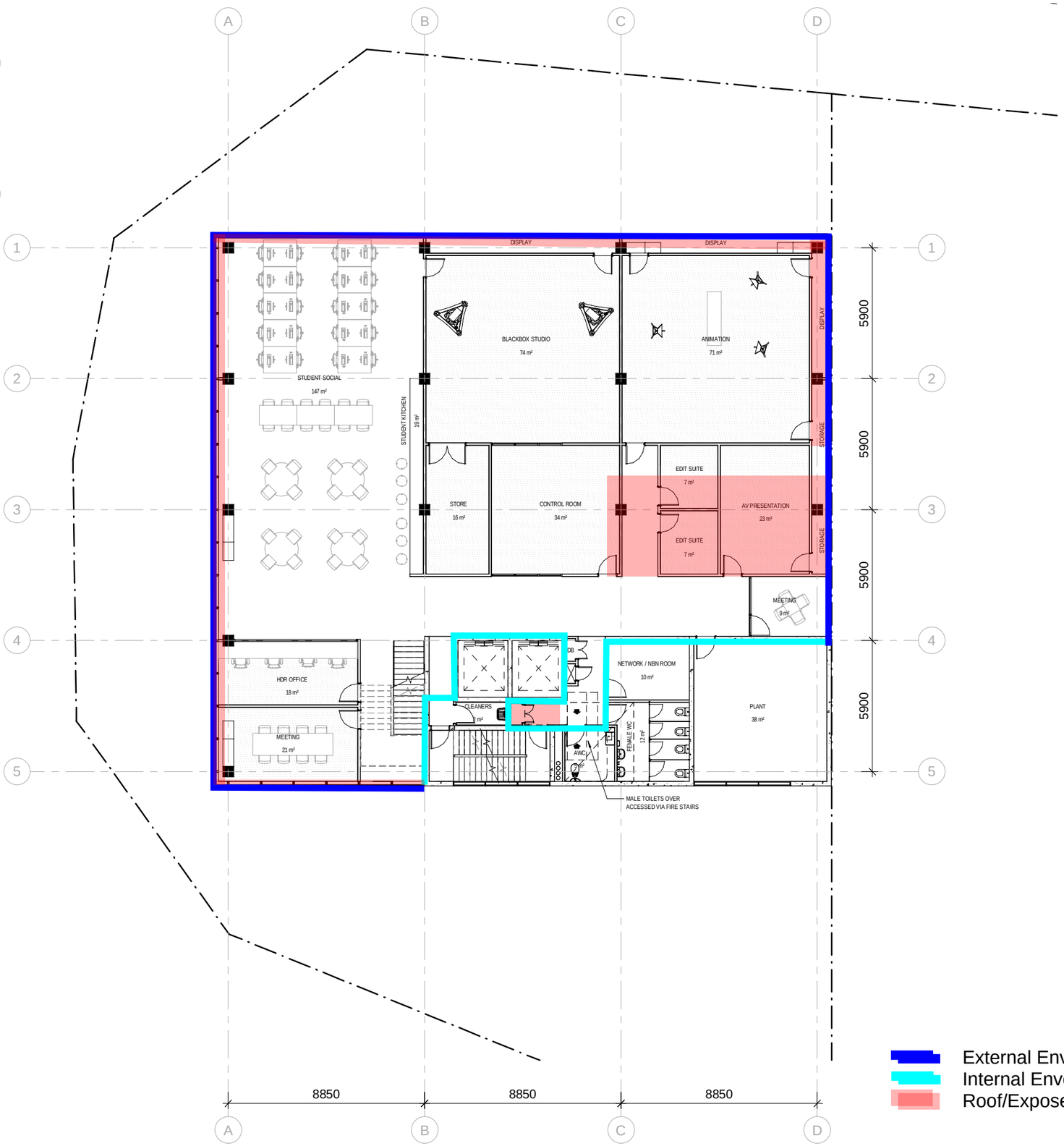

External Envelope Wall - total R value R2.8
Internal Envelope Wall - total R value R1.8
Roof/Exposed Ceiling - total R value R3.2

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Nominated Architect - Bernard Collins | NSW Architects Registration No: 4438
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D	2018/10/04	ISSUE FOR REVIEW
E	2018/10/08	ISSUE FOR REVIEW
F	2018/10/18	ISSUE FOR REVIEW
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L	2019/01/18	ISSUE FOR SCHEMATIC DESIGN

DRN	CHKD	VRFD
NJH	AKF	
NJH	AKF	
NJH	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
NJH/JE	AKF	
JE	AKF	

PROJECT : HCCD STAGE 1A

CLIENT : UNIVERSITY OF NEWCASTLE

SITE : 16B HONEYSUCKLE DRIVE NEWCASTLE, NSW, 2300

DRAWING : LEVEL 1 PLAN

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

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DRAWN : NJH

DATE : SEP 2018

SCALES : 1 : 100 @ A1, 1 : 200 @ A3

PROJECT No :	PHASE :	DRAWING No :	REV :
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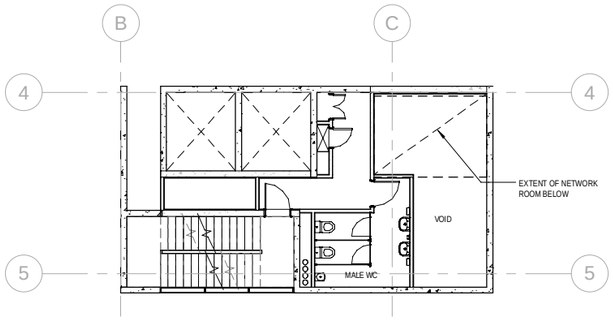
EJE architecture



2 LEVEL 2 MEZZANINE - MALE W/C

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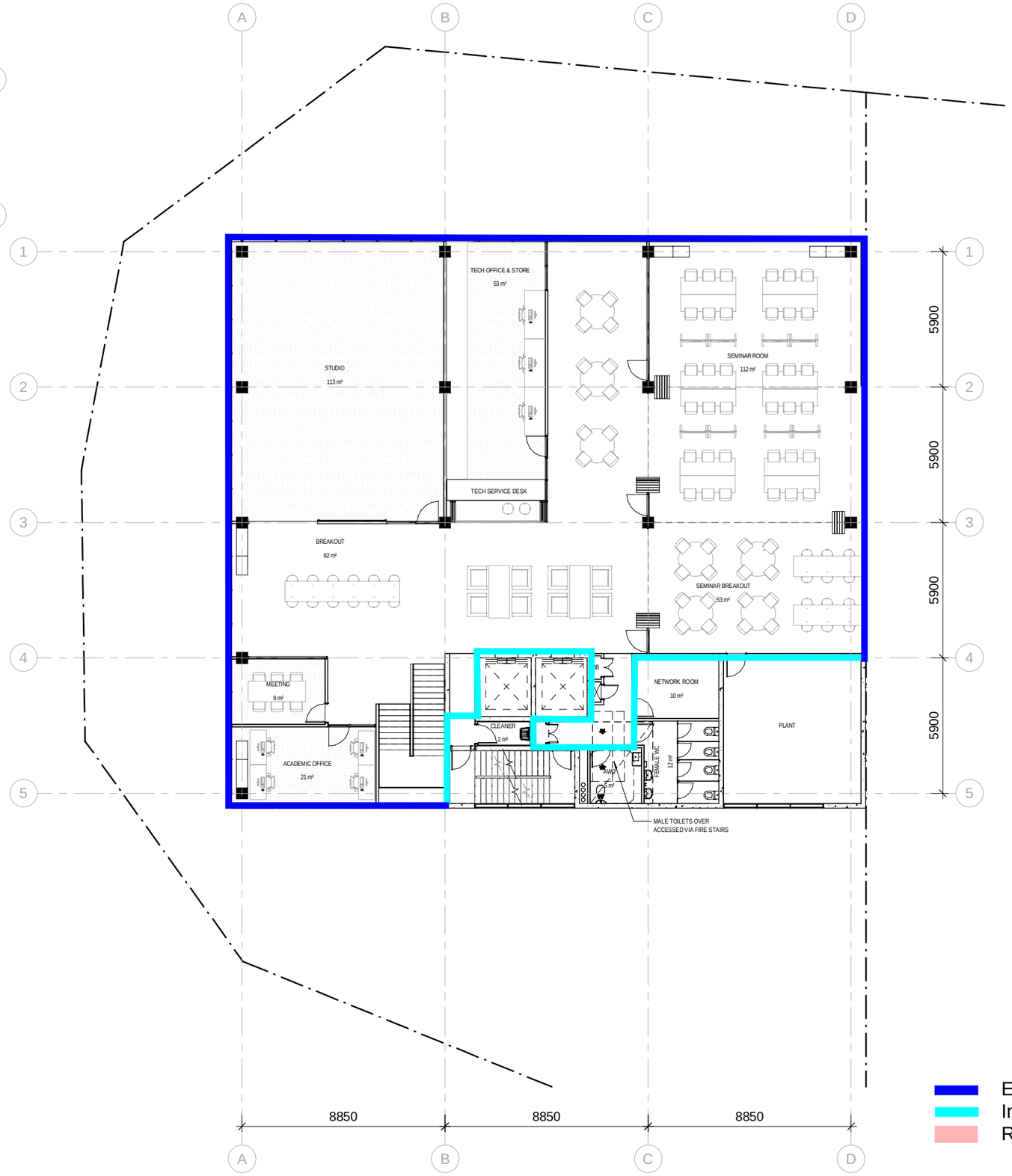

External Envelope Wall - total R value R2.8
Internal Envelope Wall - total R value R1.8
Roof/Exposed Ceiling - total R value R3.2

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E	2018/10/08	ISSUE FOR REVIEW
F	2018/10/18	ISSUE FOR REVIEW
G	2018/10/30	ISSUE FOR REVIEW
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L	2019/01/18	ISSUE FOR SCHEMATIC DESIGN

DRN	CHKD	VRFD
NJH	AKF	
NJH	AKF	
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JE	AKF	
JE	AKF	
JE	AKF	
NJH/JE	AKF	
JE	AKF	

PROJECT : HCCD STAGE 1A

CLIENT : UNIVERSITY OF NEWCASTLE

SITE : 16B HONEYSUCKLE DRIVE NEWCASTLE, NSW, 2300

DRAWING : LEVEL 2 PLAN

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

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DRAWN : NJH

DATE : SEP 2018

SCALES : 1 : 100 @ A1, 1 : 200 @ A3

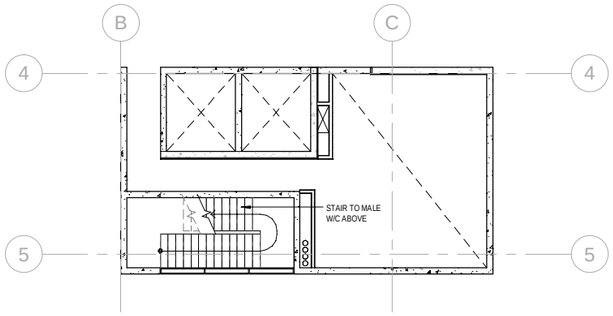
PROJECT No : 11749

PHASE : SD

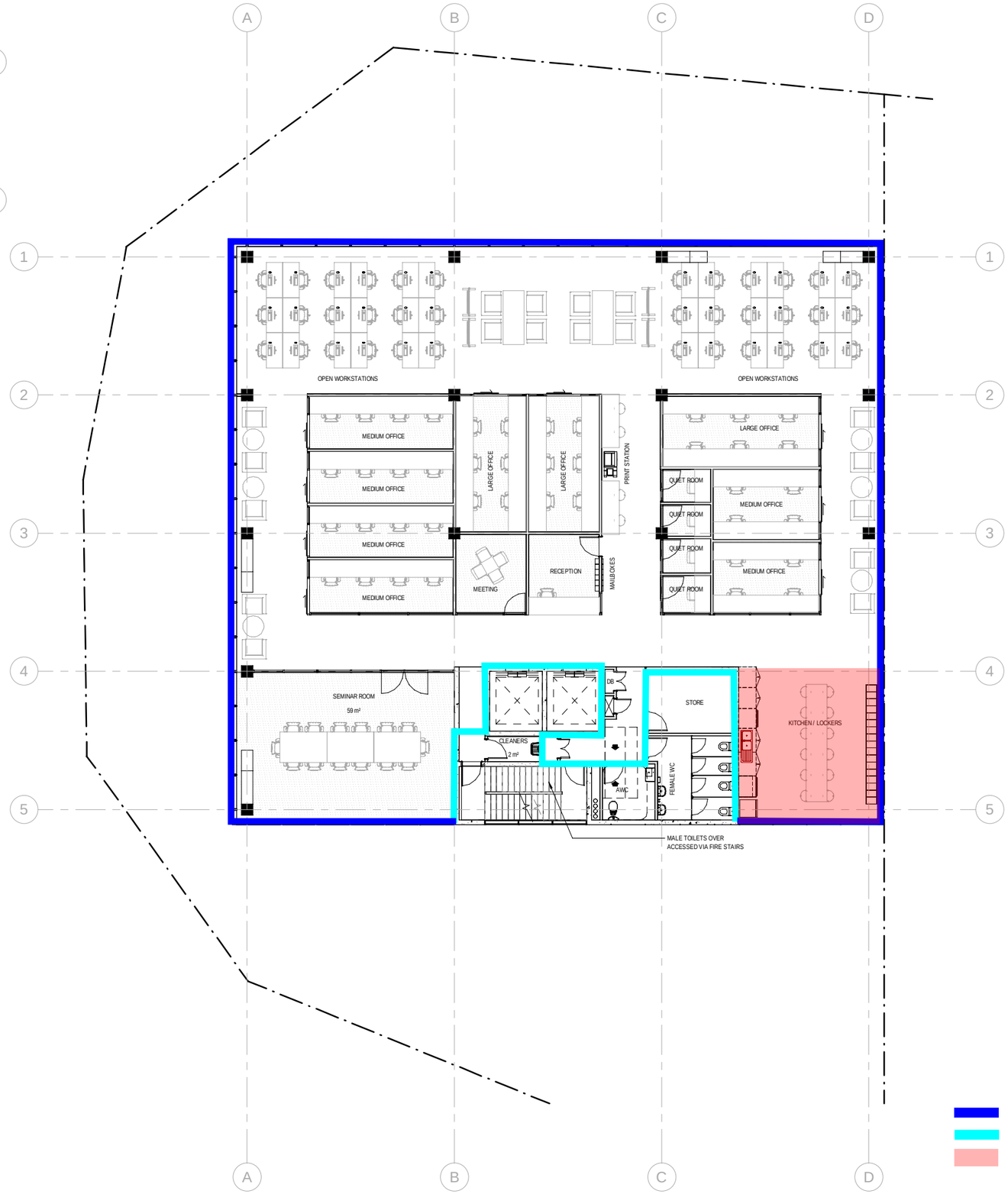
DRAWING No : A-102

REV : L

EJE architecture



2 LEVEL 3 MEZZANINE - MALE W/C
1 : 100



External Envelope Wall - total R value R2.8
Internal Envelope Wall - total R value R1.8
Roof/Exposed Ceiling - total R value R3.2

EJE ARCHITECTURE
ACN 002 912 843 | **ABN** 82 644 649 849
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P +61 2 4929 2353 | **F** +61 2 4926 3069 | **E** mail@eje.com.au | **W** www.eje.com.au
A 412 KING STREET, NEWCASTLE, NSW 2300

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0 25mm 100mm 200mm ON ORIGINAL A1

REV	DATE	COMMENTS
A	2018/09/17	ISSUE FOR INFORMATION
B	2018/09/18	ISSUE FOR PRELIMINARY COSTING
C	2018/09/25	ISSUE FOR CLIENT REVIEW
D	2018/10/04	ISSUE FOR REVIEW
E	2018/10/08	ISSUE FOR REVIEW
F	2018/10/18	ISSUE FOR REVIEW
G	2018/10/30	ISSUE FOR REVIEW
H	2018/11/22	ISSUE FOR REVIEW
J	2018/12/10	ISSUE FOR REVIEW
K	2018/12/12	ISSUE FOR SCHEMATIC DESIGN
L	2019/01/18	ISSUE FOR SCHEMATIC DESIGN

DRN	CHKD	VRFD
NJH	AKF	
NJH	AKF	
NJH	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
JE	AKF	
NJH/JE	AKF	
JE	AKF	

PROJECT : HCCD STAGE 1A

CLIENT : UNIVERSITY OF NEWCASTLE

SITE : 16B HONEYSUCKLE DRIVE NEWCASTLE, NSW, 2300

DRAWING : LEVEL 3 PLAN

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DRAWN : NJH

DATE : SEP 2018

SCALES : 1 : 100 @ A1
1 : 200 @ A3

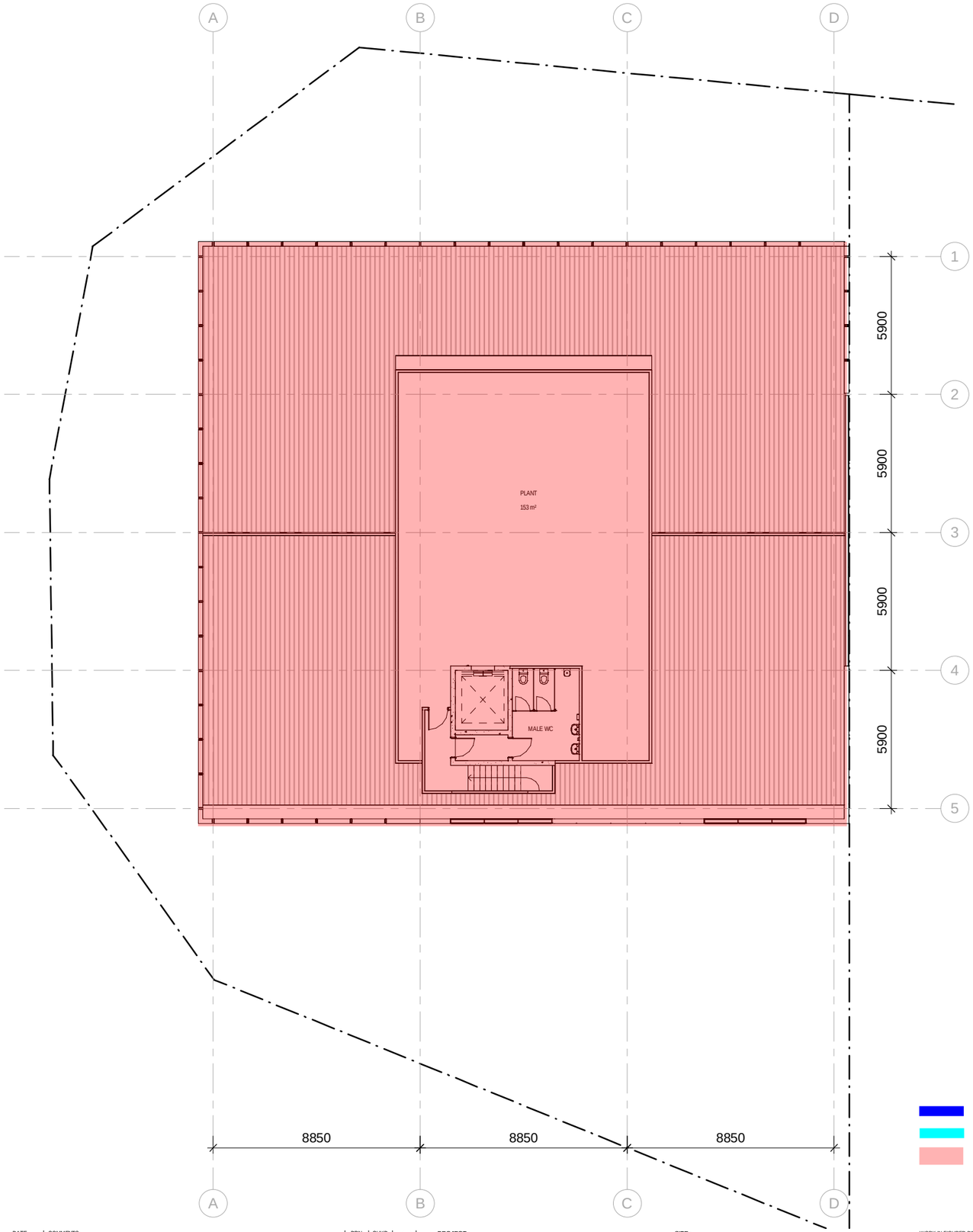
PROJECT No : 11749

PHASE : SD

DRAWING No : A-103

REV : L

EJE architecture



External Envelope Wall - total R value R2.8
Internal Envelope Wall - total R value R1.8
Roof/Exposed Ceiling - total R value R3.2

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0 25mm 100mm 200mm ON ORIGINAL A1

REV	DATE	COMMENTS
A	2018/09/17	ISSUE FOR INFORMATION
B	2018/09/18	ISSUE FOR PRELIMINARY COSTING
C	2018/09/25	ISSUE FOR CLIENT REVIEW
D	2018/12/12	ISSUE FOR SCHEMATIC DESIGN
E	2019/01/18	ISSUE FOR SCHEMATIC DESIGN

DRN	CHKD	VRFD
NJH	AKF	
NJH	AKF	
NJH	AKF	
NJH	AKF	
NJH/JE	AKF	
JE	AKF	

PROJECT : HCCD STAGE 1A

CLIENT : UNIVERSITY OF NEWCASTLE

SITE : 16B HONEYSUCKLE DRIVE NEWCASTLE, NSW, 2300

DRAWING : PLANT LEVEL PLAN

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

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DATE : SEP 2018

SCALES : 1 : 100 @ A1, 1 : 200 @ A3

PROJECT No :	PHASE :	DRAWING No :	REV :
11749	SD	A-104	E

EJE architecture

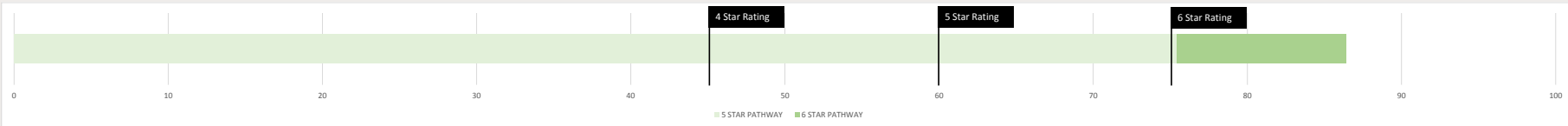
APPENDIX B

GREEN STAR PATHWAY

GREEN STAR - V1.1 DESIGN AND AS BUILT SCORECARD

Project: University of Newcastle - HCCD Stage 1A
Targeted Rating: 5 Star
Revision: 01
Date: 19/12/2018

TOTALS	AVAILABLE	5 STAR PATHWAY	6 STAR PATHWAY
CORE POINTS	**100**	**65.4**	**76.4**
INNOVATION POINTS	**10**	**10**	**10**
TOTAL SCORE TARGETED		**75.4**	**86.4**



CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA		POINTS AVAILABLE	5 STAR PATHWAY	6 STAR PATHWAY	COMMENT
Management					**14**			
Green Star Accredited Professional	To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended.	1.0	Accredited Professional	1 point is available where a Green Star Accredited Professional – Design & As Built (GSAP) has been contractually engaged to provide advice, support and information related to Green Star principles, structure, timing and processes, at all stages of the project, leading to certification.	1	1	1	Completed throught WSP enagement and activities
Commissioning and Tuning	To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.	2.0	Environmental Performance Targets	In order for the minimum requirement to be met, documented targets for the environmental performance of the project must be set. Owner's Project Requirements (OPR) to be developed and to nominate energy and water consumption targets for project.	-	Complies	Complies	This can be achieved through a short report which includes the targets for the project energy and water consumption, and energy and water budgets for all nominated systems. This should be completed during the design phase.
		2.1	Services and Maintainability Review	1 point is available where a comprehensive services and maintainability review of the project is performed. Services and Maintainability Review to be conducted during design stage prior to construction for all nominated building systems and must address commissionability, controllability, maintainability, operability and safety.	1	1	1	Requires a review of the building services design covering Commissionability, controllability, maintainability, operability and safety. The review should be documented in a report and completed prior to start of construction.
		2.2	Building Commissioning	1 point is available where comprehensive pre-commissioning and commissioning activities are performed for all nominated systems. • **Commissioning Specification**: design parameters, required commissioning activities, operation and acceptable tolerances for all systems • **Commissioning Plan**: Commissioning plan must be developed and include objectives, scope, team and responsibilities, sequence of commissioning, procedures, witnessing, program and manuals.	1	1	1	Requires commissioning processes in accordance with relevant commissioning guidelines. SHould be achieved through BAU.
		2.3	Building Systems Tuning	1 point is available where a tuning process is in place that addresses all nominated systems. Tuning Commitment to be included within commissioning plan.	1	1	1	Requires quarterly adjustments and measurements for the first 12 months after occupation. Design team members must be engaged during this process
		2.4	Independent Commissioning Agent	1 additional point is available for utilisation of an Independent Commissioning Agent (ICA) to advise, monitor, and verify the commissioning and tuning of the nominated systems throughout the design, tender, construction, commissioning and tuning phases.	1	1	1	Requires engagement of an Independent Comissioning Agent by UoN. This Engagement should be confirmed by UoN. A facilities manager who is suitably experienced can also fulfil this role.
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3.1	Implementation of a Climate Adaptation Plan	* A project specific Climate Adaptation Plan has been developed in accordance with a recognised standard; and * Solutions have been included into the building design and construction that specifically address the risk assessment component of the adaptation plan.	2		2	**6 STAR STRATEGY** Would require engagement to complete a Climate Adaptation Plan and implement high risk mitigations within the design WSP approx cost ~$10,000. May have some design or cost implications depending on assessment outcomes, but would ensure development of a resilient asset, with a lower risk of loss in future climate events
Building Information	To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance.	4.1	Building O&M Information	1 point is available where it is demonstrated that comprehensive Operations and Maintenance information is developed and made available to the facilities management team.	1	1	1	Building Operations and Maintenance Information is to be developed by building services subcontractors in line with Green Star Requirements.
		4.2	Building User Information	1 point is available where relevant and current building user information is developed and made available to all relevant stakeholders.	1	1	1	Building User Information is to be developed, providing building user information on how to use each major system.
Commitment to Performance	To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.	5.1	Environmental Building Performance	1 point is awarded if at least 80% of the project's gross floor area (GFA), excluding carparking areas, is covered by a commitment to set, measure and report on its environmental performance (Targets to be set for : Greenhouse Gas Emissions, Potable Water, Operational Waste, Indoor Environmental Quality).	1	1	1	For Owner/Occupied buildings such as this project, this requires an internal policy commitment document that sets out the environmental targets for at least 2 of the following: GHG Emissions, Potable Water, Operational Waste, IEQ or alternatively commit to completing a Green Star Performance Rating
		5.2	End of Life Waste Performance	1 point is awarded where at least 80% of the project's GFA, excluding carparking areas, has a formal commitment in place to reduce demolition waste at the end of life of an interior fitout or base building component. Compliance shall be demonstrated by providing a commitment to either: A. Establish contractual agreements, or; B. Achieve a certified operational performance rating for the building, addressing waste from refurbishments.	1	1	1	This requires a commitment from UoN that the fitout life will be for at least 10 years without major refit.
Metering and Monitoring	To recognise the implementation of effective energy and water metering and monitoring systems.	6.0	Metering	To qualify for this credit, it is a minimum requirement that accessible metering be provided to monitor building energy and water consumption, including all energy and water common uses and major uses, and sources.	-	Complies	Complies	All major energy and water uses of the project to be metered, including separate metering for lighting and power per floor, any energy use that is expected to use more than 5% of the building load and any water use that is expected to use more than 10% of the building load. Meters to be capable of capturing data at intervals of 15mins.
		6.1	Monitoring Systems	1 point is available where a monitoring strategy is addressed through a monitoring system, capable of capturing and processing the data produced by the installed energy and water meters, and accurately and clearly presenting data consumption trends.	1	1	1	Monitoring system to be installed to capture and report data to the building owner. Building Monitoring System (BMS) to be developed in accordance with a recognised standard such as CIBSE TM39 Building Energy Metering .
Responsible Construction Practices	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan	1 point is available where a formalised, systematic and methodical approach to planning, implementing and auditing is in place during construction, to ensure conformance with the EMP.	-	Complies	Complies	Contractor shall develop and implement an EMP for the construction phase of the project.
		7.1	Formalised Environmental Management System	1 point is available where a formalised, systematic and methodical approach to planning, implementing and auditing is in place during construction, to ensure conformance with the EMP.	1	1	1	Contractor shall have an environmental management system in place for formalised planning, implementing and auditing to ensure compliance with the EMP.
Operational Waste	Performance Pathway	8A	Prescriptive Pathway	1 point is available where facilities are in place to collect and separate distinct waste streams, and where these facilities meet best practice access requirements for collection by the relevant waste contractor.	1	1	1	Development of an opertional waste management plan compliant with Green Star Requirements
Total					**14**	**12**	**14**	
Indoor Environment Quality					**17**			
Indoor Air Quality	To recognise projects that provide high air quality to occupants.	9.1	Ventilation System Attributes	1 point is available where: -The entry of outdoor pollutants is mitigated; -The system is designed for ease of maintenance and cleaning; and -The system has been cleaned prior to occupation and use.	1	1	1	Requires strategic placement of ventilation system air intakes, protection or cleaning of ductwork prior to occupation, and the design must include access points for maintenance and cleaning of all debrit gathering elements.
		9.2	Provision of Outdoor Air	2 points are available where the nominated area is provided with sufficient outdoor air to ensure levels of indoor pollutants are maintained below acceptable levels. 1 Point awarded for providing air at a rate 50% greater than minimum required (AS 1668.2.2012). 2 Points awarded where air provided at a rate greater than 100%.	2	1	1	Requires improved outside air rate at a 50% improvement on code compliance (ie, if code requires 7.5 L/s/p, project will provide 11.25L/s/p) Suggest that CO2 monitors are provided and CO2 controlled to no greater than 800ppm
		9.3	Exhaust or Elimination of Pollutants	1 point is available where nominated pollutants, such as those arising from printing equipment, cooking processes and equipment, and vehicle exhaust, are limited by either removing the source of pollutants from the nominated area, or exhausting the pollutants directly to the outside while limiting their entry into other areas of the project.	1	1	1	Can be achieved through low emission printers and provision of exhaust in other areas
Acoustic Comfort	To reward projects that provide appropriate and comfortable acoustic conditions for occupants.	10.1	Internal Noise Levels	1 point is available where internal ambient noise levels in the nominated area are suitable and relevant to the activity type in the room. This includes all sound generated by the building systems and any external noise ingress. Internal Ambient noise level to be no more than 5dB(A) than Table 1 of AS/NZS 2107:2000.	1	1	1	Acoustic consultant to confirm if this is achievable.
		10.2	Reverberation	1 point is available where the nominated area has been built to reduce the persistence of sound to a level suitable to the activities in the space. Reverberation to be below maximum stated in Table 1 of AS/NZS 2107:2000.	1		1	**6 STAR STRATEGY** Acoustic consultant to confirm if this is achievable. May require additional acoustic treatment
		10.3	Acoustic Separation	1 point is available where the nominated enclosed spaces have been built to minimise crosstalk between rooms and between rooms and open areas. Noise Transmission in enclosed spaces are addressed through either sound reduction construction (Partitions between spaces to have a weighted sound reduction index of 45) or sound insulation measurement.	1	1	1	Acoustic consultant to confirm if this is achievable.
		11.0	Minimum Lighting Comfort	It is a minimum requirement of this credit that lights in the nominated area are flicker free and accurately address the perception of colour in the space. Lighting to be flicker free and have a minimum CRI of 80.	-	Complies	Complies	Achieved through LED lighting technology

Lighting Comfort	To encourage and recognise well-lit spaces that provide a high degree of comfort to users.	11.1	General Illuminance and Glare Reduction	1 point is available where, in the nominated area: - Lighting levels and quality comply with best practice guidelines (AS1680); and - Glare is eliminated.	1	1	1	To be confirmed by lighting designer, typically achieved quite easily
		11.2	Surface Illuminance	1 point is available where a combination of lighting and surfaces improve uniformity of lighting to give visual interest in the nominated area. A) Average ceiling reflectance of 0.75 and average illuminance of at least 30% of the lighting levels on the working plane. B) * The average ceiling luminance (excluding light fixtures) does not exceed 0.5 kcd/m2 and the maximum luminance at any point on the ceiling does not exceed 1.5 kcd/m2; * The ceiling area has an average surface illuminance of at least 30% of the lighting levels on the working plane; and * In rooms less than 100m2, or in rooms where more than 20% of workstations are located within 3m of walls, the wall area above the working plane has an average surface illuminance of at least 50% of the lighting levels on the working plane.	1	1	1	Requires uplighting of ceiling, can be expensive. EJE have advised uplighting will be provided within design
		11.3	Localised Lighting Control	1 point is available where; in the nominated area, occupants have the ability to control the lighting in their immediate environment. Staff to have access to their workstation lights- including on/off and adjusting light levels.	1	1	1	To be confirmed by lighting designer, typically achieved quite easily
Visual Comfort	To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.	12.0	Glare Reduction	It is a minimum requirement of this credit that the glare, in the nominated area, from sunlight through all viewing façades is reduced through a combination of blinds, screens, fixed devices, or other means. * Fixed devices must be shown to shade the nominated plane, 1.5m in from the viewing façade. The nominated plane must be shown to be shaded from direct sunlight for 80% of the nominated occupied hours for each day of the winter and spring equinoxes and the summer and winter solstices.	-	Complies	Complies	Will require blockout blinds on all glazed areas
		12.1	Daylight	Up to 2 points are available where a percentage of the nominated area receives high levels of daylight during 80% of the nominated occupied hours: - For 40% of the nominated area – 1 point; -For 60% of the nominated area – 2 points.	2	1	1	To be confirmed by ESD consultant through daylight modelling
		12.2	Views	1 point is available where 60% of the nominated area has a clear line of sight to a high quality internal or external view.	1	1	1	To be confirmed by ESD consultant
Indoor Pollutants	To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels.	13.1	Paints, Adhesives, Sealants and Carpets	1 point is available where at least 95% of all internally applied paints, adhesives, sealants and carpets meet stipulated 'Total VOC Limits', or, where no paints, adhesives, sealants or carpets are used in the building.	1	1	1	Procurement requirement which will be addressed through specifications
		13.2	Engineered Wood Products	1 point is available where at least 95% of all engineered wood products meet stipulated formaldehyde limits or no new engineered wood products are used in the building.	1	1	1	Procurement requirement which will be addressed through specifications
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	1 point is available where a high degree of thermal comfort is provided to occupants in the space equivalent to 80% of all occupants being satisfied in the space. PMV levels to be between -1 and +1 OR ensure that HVAC system meets specific requirements.	1	1	1	To be confirmed by ESD consultant through Thermal Comfort modelling
		14.2	Advanced Thermal Comfort	1 additional point is available where a high degree of thermal comfort is provided to occupants in the space equivalent to 90% of all occupants being satisfied in the space. PMV levels to be between -0.5 and +0.5	1			Typically difficult to achieve given extent of glazing
Total					**17**	**13**	**14**	
Energy					**22**			
Greenhouse Gas Emissions		15E.0	Conditional Requirement: Reference Building Pathway	Project teams must demonstrate that the minimum 10% improvement over a benchmark building is achieved	-	Complies	Complies	See below
		15E.1	Comparison to a Reference Building Pathway	Modelled pathway: Project teams must demonstrate that the Proposed Building greenhouse gas (GHG) emissions are less than those of the equivalent Benchmark Building. The Benchmark Building represents a 10% improvement on the Reference Building. The Reference building is a building which achieves minimal compliance with the NCC Section J DTS provisions. Up to 20 points are available for this credit. Points are awarded independently for improving on the building's fabric against a Reference Building (4 points), and for reducing emissions against the Benchmark Building (16 points).	20	14.4	14.4	This credit has been made complicated through introduction of NCC2019, these points represent a strategy against NCC2016. The building should be designed to be very high efficiency through the following: High performance glazing system high performance and efficiency heating, cooling and lighting system Whole of roof area = 635m2, Area for PV (75%) = 476.25m2 System size = 90 kW (high efficiency LG solar panels) Points include UoN 6 year 100% renewable energy supply agreement
Peak Electricity Demand Reduction	Performance Pathway	16B	Performance Pathway - Reference Building	Up to 2 points are available where it is demonstrated that the project's predicted peak electricity demand has been reduced below that of a Reference Building: *0-10%: 0 point * 20% : 1 point * 30%: 2 points	2	1	2	To be modelled. May be achieved through design intitatives and rooftop PV 6 STAR STRATEGY To be determined if we are achieving this in modelling. May require further efficiency or rooftop PV to drive demand reduction.
Total					**22**	**15.4**	**16.4**	
Transport					**10**			
Sustainable Transport	Performance Pathway	17A	Sustainable Transport Plan	Up to 10 points are available where projects provide access to sustainable transport infrastructure which decreases greenhouse gas emissions from transport, decreases mental and social impacts of commuting, and encourages the uptake of healthier active transport options.	10		6	6 STAR STRATEGY Requires development of a sustainable transport plan. The plan would dictate the likely mode of transport and points are rewarded based on driving a mode switch to more sustainable options. No additional capital cost, no additional fee from WSP. Additional fee likely required by the transport planning consultant.
	Prescriptive Pathway	17B.1	Access by Public Transport	Up to 3 points are available based on the accessibility of the site by public transport.	3	2	N/A	Needs to be discussed with the GBCA to negotiate an appropriate assessment methodology for Newcastle.
		17B.2	Reduced Car Parking Provision	1 point is available where there is a reduction in the number of car parking spaces in the proposed building when compared to a standard-practice building.	1		N/A	Assume no new carparking on site. Innovation point can be claimed
		17B.3	Low Emission Vehicle Infrastructure	1 point is available where parking spaces and/or dedicated infrastructure is provided to support the uptake of low-emission vehicles.	1		N/A	N/A
		17B.4	Active Transport Facilities	1 point is available where bicycle parking and associated facilities are provided to regular building occupants and visitors.	1	1	N/A	Potential for point based on commitment to centralised future system
		17B.5	Walkable Neighbourhoods	1 point is available where the project is located conveniently to amenities or the project achieves a specified Walk Score.	1	1	N/A	Achieved
Total					**10**	**4**	**6**	
Water					**12**			
Potable Water	Performance Pathway	18A.1	Potable Water - Performance Pathway	Points achieved by the Performance Pathway are determined in accordance with the Green Star Potable Water Calculator.	12	6	6	Assumptions: Toilets = 4 star Urinals = 6 star Taps = 5 stars Showers = not included Dishwasher = 5 star WELS Landscaped area = 66m2 of native species (no irrigation) Rainwater tank = 20 000 L capacity
		18A.2	Sanitary Fixture Efficiency		1	N/A	N/A	
		18A.3	Rainwater Reuse		1	N/A	N/A	
		18A.4	Heat Rejection		2	N/A	N/A	
		18A.5	Landscape Irrigation		1	N/A	N/A	
		18A.6	Fire System Test Water		1	N/A	N/A	
Total					**12**	**6**	**6**	
Materials								
		19A	LCA Performance Pathway	Up to 7 points are available where a whole-of-building, whole-of life (cradle-to-grave) life cycle assessment (LCA) is conducted for the project and a reference building. Points are awarded based on the extent of environmental impact reduction achieved against six environmental impacts categories, when compared to a reference building, with an option to expand reporting to additional criteria.	7	N/A	7	6 STAR STRATEGY Requires development of a Life Cycle Assessment, and compares the embodied + operational environmental impacts of the project compared to a "business as usual" approach. Due to CLT and a very high operational efficiency, the project will likley score very well, achieving all points, and likely innovaiton points for exceeding benchmarks. . No additional capital cost, fee from WSP ~$15,000.

Life Cycle Impacts		19B.1	Concrete	Up to 2 points are available where the Portland cement content in all concrete used in the project has been reduced by replacing it with supplementary cementitious materials. 1 point is available where the Portland cement content is reduced by 30%, measured by mass across all concrete used in the project compared to the reference case; OR 2 points are available where the Portland cement content is reduced by 40%, measured by mass across all concrete used in the project compared to the reference case. 0.5 point is available where the mix water for all concrete used in the project contains at least 50% captured or reclaimed water (measured across all concrete mixes in the project). 0.5 point is available where either: At least 40% of coarse aggregate in the concrete is crushed slag aggregate or another alternative materials (measured by mass across all concrete mixes in the project), provided that use of such materials does not increase the use of Portland cement by over five kilograms per cubic meter of concrete; OR At least 25% of fine aggregate (sand) inputs in the concrete are manufactured sand or other alternative materials (measured by mass across all concrete mixes in the project), provided that use of such materials does not increase the use of Portland cement by over five kilograms per cubic meter of concrete.	3	1	N/A	Final approach TBD
		19B.2	Steel	Up to 2 points are available when there is a reduction in the mass of steel reinforcement used when compared to standard practice.	1	1	N/A	Potentially achievable based on reinforcement steel
		19B.3	Building Reuse	1 point is available where at least 50% (by area) of the building façade is retained; OR 2 points are available where the proportion retained is 80%. 1 point is available where at least 30% (by mass) of the existing major structure is retained; OR 2 points are available where the proportion retained is 60%. Major structure is defined as floors, columns, beams, load bearing walls and foundations. The measure of retained building structure shall be based on gross building volume. Gross building volume is measured as the building footprint (m2) x building height (m). For a proportion of the existing major structure to be considered reused, all the major structural elements must be retained in that part of the building. The reused percentage should be calculated as a proportion of the existing structure volume. Where more than 20% of a structural element is replaced as part of the refurbishment, the element may not be counted as reused.	4			N/A
Responsible Building Materials	To reward projects that include materials that are responsibly sourced or have a sustainable supply chain.	20.1	Structural and Reinforcing Steel	1 point is available where 95% of the building's steel (by mass) is sourced from a Responsible Steel Maker; A. For steel framed buildings, at least 60% of the fabricated structural steelwork is supplied by a steel fabricator/steel contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute (ASI); OR B. For concrete framed buildings, at least 60% (by mass) of all reinforcing bar and mesh is produced using energy-reducing processed in its manufacture (measured by average mass by steel maker annually).	1	1	1	Potentially achievable based on reinforcement steel
		20.2	Timber Products	1 point is available where at least 95% (by cost) of all timber used in the building and construction works is either: A. Certified by a forest certification scheme that meets the GBCA's 'Essential' criteria for forest certification; OR B. Is from a reused source.	1	1	1	Procurement requirement which will be addressed through specifications. Will require CLT to be certified timber
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1 point is available where 90% (by cost) of all permanent formwork, pipes, flooring, blinds and cables in a project either: A. Do not contain PVC and have an Environmental Product Declaration (EPD); OR B. Meet Best Practice Guidelines for PVC.	1	1	1	Procurement requirement which will be addressed through specifications.
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	Up to 3 points are available when a proportion of all materials used in the project meet transparency and sustainability requirements under one of the following initiatives: A. Reused Products; B. Recycled Content Products; C. Environmental Product Declarations; D. Third-Party Certification; or E. Stewardship Programs. Points are calculated based on specified benchmarks for the percentage of compliant products used in the project.	3	2	2	Procurement requirement which will be addressed through specifications.
Construction and Demolition Waste	Percentage Benchmark	22B	Percentage Benchmark	1 point is available where the construction waste going to landfill is reduced by either: A. Minimising the total amount of waste sent to landfill when compared against a typical building; OR B. Diverting a significant amount of waste from going to landfill as a proportion of waste generated.	1	1	1	Procurement requirement which will be addressed through specifications.
Total					**22**	**8**	**13**	
Land Use & Ecology								
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	To meet the minimum requirement for this credit, the project must demonstrate that no critically endangered, endangered, or vulnerable species, or ecological communities were present on the site at time of purchase.	-	Complies	Complies	met
		23.1	Ecological Value	Up to 3 points are awarded where the ecological value of the site is improved by the project. The number of points awarded is determined by the Ecological Value Calculator based on a comparison of the condition of the site before and after design/construction.	3	1	1	Current design allows for 1 point = 66m2 of native planted species
Sustainable Sites	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.0	Conditional Requirement	The Conditional Requirement is met where, at the date of site purchase or date of option contract, the project site did not include old growth forest or wetland of 'High National Importance', or did not impact on 'Matters of National Significance'.	-	Complies	Complies	met
		24.1	Reuse of Land	1 point is available where 75% of the site was Previously Developed Land at the date of site purchase or (for previously owned land) at the project's Green Star registration date.	1	1	1	met
		24.2	Contamination and Hazardous Materials	1 point is available where the site, or an existing building, was previously contaminated and the site has been remediated in accordance with a best practice remediation strategy.	1			Has the site been contaminated and fully remediated? Will be investigated in future design stages
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.0	Heat Island Effect Reduction	One (1) point is awarded where, when assessed in plan view, at least 75% of the whole site area comprises of one or a combination of the following: * Vegetation; * Green roofs; * Roofing materials, including shading structures, having the following: -For roof pitched <15°– a three year SRI >64; or -For roof pitched >15°– a three year SRI >34. * Only where the three year Solar Reflectance Index (SRI) for products is not available, use the following: -For roof pitched <15° – an initial SRI > 82; or -For roof pitched >15° – an initial SRI > 39. * Unshaded hard-scaping elements with a three year SRI > 34 or an initial SRI > 39; * Hard-scaping elements shaded by overhanging vegetation or roof structures, including solar hot water panels and photovoltaic panels; * Water bodies and/or water courses; or * Areas directly to the south of vertical building elements, including green walls and areas shaded by these elements at the summer solstice.	1	1	1	Will require lighter coloured roof / surfaces to achieve
Total					**6**	**3**	**3**	
Emissions								
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Stormwater Peak Discharge	1 point is available where the post-development peak event discharge from the site does not exceed the pre-development peak event discharge.	1	1	1	Civil designer to confirm if this is achievable
		26.2	Stormwater Pollution Targets	1 additional point is available, where the first point has been achieved and all stormwater discharged from site meets specified Pollution Reduction Targets for: - Total suspended solids - Gross Pollutants - Total Nitrogen (TN) - Total Phosphorus (TP) - Total Petroleum Hydrocarbons - Free Oils	1	1	1	Civil designer to confirm if this is achievable
		27.0	Light Pollution to Neighbouring Bodies	For the project to be awarded a point for this credit, the project must comply with AS 4282:1997 Control of the Obtrusive Effects of Outdoor Lighting. Signage related to emergency exits and external emergency lighting that only illuminates in the event of an emergency/power failure are excluded from the requirements of this credit.	-	Complies	Complies	Lighting designer to confirm this is achievable

Light Pollution	To reward projects that minimise light pollution.	27.1	Light Pollution to Night Sky	One (1) point is awarded where it can be demonstrated that one of the following specified reductions in light pollution has been achieved by the project. A. Control of upward light output ratio (ULOR) - Project must demonstrate that no external luminaire on the project has a ULOR that exceeds 5%, relative to its actual mounted orientation; OR B. Control of direct illuminance. - Project must demonstrate that direct illuminance from external luminaries on the project produces a maximum initial point illuminance value no greater than: *0.5 Lux to the site boundary; and *0.1 Lux to 4.5 metres beyond the site into the night sky, when modelled using a calculation plane set at the highest point of the building. Calculations shall be in accordance with AS 4282:1997.	1	1	1	Lighting designer to confirm this is achievable
Microbial Control	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28.0	Legionella Impacts from Cooling Systems	1 point is available where: * The building is naturally ventilated; or * The building has waterless heat-rejection systems; or * The building has water-based heat rejection systems that includes measures for Legionella control and Risk Management.	1			Difficult to achieve when using cooling towers
Refrigerant Impacts	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.0	Refrigerants Impacts	1 point is awarded where one of the following criteria is achieved: * The combined Total System Direct Environmental Impact (TSDEI) of the refrigerant systems in the building is less than 15; OR * The combined TSDEI of the refrigerant systems is between 15 and 35, AND a leak detection system ||with automated refrigerant recovery is in place ||R1.29.01; OR * All refrigerants in the project have an ozone depletion potential of zero, and a global warming potential of 10 or less; OR * Where there are no refrigerants employed by nominated building systems, this point is awarded.	1	1	1	Can be achieved using a central chiller, without any other refrigerant on the site. Usually will require automatic pump down system and alarm
Total					**5**	**4**	**4**	
Innovation								
Innovative Technology or Process	The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.	30A	Innovative Technology or Process		10	2	2	2 points achieved through rooftop PV providing 10% of buildings energy consumption
Market Transformation	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation	30B	Market Transformation					
Improving on Green Star Benchmarks	The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark	30C	Improving on Green Star Benchmarks					
Innovation Challenge	Where the project addresses an sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge			8	8	1. Financial Transparency 2. Community Benefits 3. Air tightness testing (Performance achieved) 4. Marketing Excellence 5. Occupant Engagement 6. Reconciliation Action 7. Social Return on Investment 8. Local Procurement 9. Universal Design 10. Student sustainability education programmes within building 11. Any other sustainability technology with environmental, or social benefits 12. Contractor Education 13. Energy Metering Integrity Suggest a full review for University of Newcastle policies and initiatives to determine any further opportunities. Maximum of 10 points can be awarded
Global Sustainability	Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue	30E	Global Sustainability					
Total					**10**	**10**	**10**	

	POINTS AVAILABLE	5 STAR	6 STAR
Management	14	12	14
Indoor Environment Quality	17	13	14
Energy	22	15.4	16.4
Transport	10	4	6
Water	12	6	6
Materials	22	8	13
Land Use & Ecology	6	3	3
Emissions	5	4	4
Innovation	10	10	10

CORE POINTS	65.4	76.4
INNOVATION	10	10
UPLIFT	N/A	11.0
TOTAL	75.4	86.4

APPENDIX C

GREEN STAR RESPONSIBILITIES MATRIX

Project: University of Newcastle - HCCD Stage 1A	5 Star Strategy Score	RESPONSIBILITY
Targeted Rating: 5 Star		
Revision: 01		
Date: 23/01/2019	75.4	

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
MANAGEMENT	12																	
1. Green Star Accredited Professional																		
1.0 Accredited Professional	1	1		X	X												X	
1 point is available where a Green Star Accredited Professional (GSAP) has been contractually engaged to provide advice, support and information related to Green Star principles, structure, timing and processes, at all stages of the project, leading to certification.				X													X	
Completed Submission Template, including: • GSAP names, contact details, and dates of appointment • Summary of the involvement of the GSAP in the project (design and as built).																	X	
Letter of appointment confirming the appointment of a GSAP in the project. • The letter must include a scope of works as per the Compliance Requirements section of the credit. • The contract or letter should confirm that the GSAP is appointed from schematic design until practical completion.				X														
Sample Meeting minutes demonstrating input from the GSAP.					X												X	
Letter from the Client confirming that the GSAP satisfactorily fulfilled his/her engagement responsibilities as per the scope of works and requirements of this credit.				X														
2. Commissioning and Tuning																		
There are 5 parts to this credit: 2.0 Environmental Performance Targets 2.1 Services and Maintainability Review 2.2 Building Commissioning 2.3 Building Systems Tuning 2.4 Independent Commissioning Agent	-	-																
2.0 Environmental Performance Targets	CR	✓						X	X	X	X					X	X	
Documented targets for the environmental performance of the project must be set. This credit requires nominated building systems to be defined by the project team. Including; • Mechanical systems (such as HVAC and refrigeration systems; mechanically operable systems such as blinds and actuated shading devices). • Building Management and Control System (BMCS). • Lighting and associated controls. • Electrical systems (such as electrical generation, electrical supply, distribution systems, security and access systems, and alarm systems). • Hydraulic systems (such as gas and water supply distribution systems, sewage collection and distribution systems, stormwater collection and distribution systems; pumps). • Fire detection systems, smoke alarm systems and emergency warning systems. • Fire protection systems, including pumps and other equipment. • Lifts and any other vertical transport devices. • Any other system that have an impact on the energy or water consumption of the building. • Building envelope, such as facades, roofs and glazing systems.								X	X	X	X					X	X	
Submission Template - - Description of the basic functions, operations, and maintenance of the nominated systems. - Details of the main components. -Target for energy consumption and budget for energy. -Target for water consumption and budget for water. - Indoor environment parameters. -Description of metering and monitoring systems					X			X	X	X						X	X	

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
Evidence of Targets for Environmental Performance where the environmental performance targets are documented as outlined in the Compliance Requirements. The relevant sections must be highlighted (as built).					X												X	
2.1 Services and Maintainability Review	1	1														X		
1 point is available where a comprehensive services and maintainability review of the project has been conducted during the design stage and prior to construction. - The services and maintainability review is to facilitate input from the design team, facilities manager and operations staff, and suppliers and subcontractors (if engaged) and must address Commission ability; Controllability; Maintainability; Operability, including 'Fitness for Purpose'; and Safety for all nominated building systems. - The services and maintainability review and its outcomes must be summarised in a 'Service and Maintainability Report' and agreed and signed off by the involved parties. Action items resulting from this review shall be incorporated in the design intent report or OPR as outlined in 2.0. Information on the requirements of this review are outlined in the approved standards and guidelines (for more information contact WSP).																X		
Submission Template - •Confirmation that the services and maintainability review has taken place. •The person/s responsible for the services and maintainability review. •A summary of the services and maintainability review.					X											X		
Service and Maintainability Report where the service and maintainability review is summarised as outlined in 2.2 Building Commissioning. The relevant sections must be highlighted					X			X	X	X						X		
2.2 Building Commissioning	1	1														X		
One (1) point is awarded when a project team can demonstrate that the pre-commissioning and commissioning activities have been performed based on the approved standards and guidelines (for more information contact WSP).																X		
2.2.1 Commissioning Specification The contractual tender or construction documentation must list the commissioning requirements for each system. the documentation must: • List the design parameters for each system; • List the required commissioning activities; • Define how each system is intended to operate; and • List the acceptable tolerances during commissioning. Contractual documentation must clearly indicate divisions of responsibilities, pre-commissioning procedures, commissioning requirements, witnessing requirements, phased completion requirements (if needed), post occupancy checks, and any training requirements for the operator.								X	X	X						X		
Submission Template - provide summary of building commissioning plan.					X			X	X	X						X		
2.2.2 Commissioning Plan A commissioning plan shall be developed and include at least the following, the: • Objectives, or basis, of the design; • Scope of the commissioning plan; • Commissioning team list, the individual responsibilities and interface matrix; • General sequence of commissioning; • Proposed commissioning procedures; • Witnessing requirements; • Commissioning program; and • Requirements for subcontractor commissioning manuals. The commissioning must have taken place in accordance with the requirements laid out in the contractual documentation and the commissioning plan. The commissioning report must certify that this is the case, and be signed by the designer, the head or main contractor, the commissioning manager (or ICA), and the project manager (or owner's representative).																X		

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
Submission Template •Summary of the building commissioning plan •Confirmation that the building commissioning has taken place according to the plan				X				X	X	X	X					X		
Extract(s) from the Commissioning Report demonstrating that comprehensive precommissioning activities and commissioning activities have been performed as outlined in 2.2. The relevant sections must be highlighted.				X				X	X	X	X					X		
2.3 Building Systems Tuning																X		
1 point is awarded where, following practical completion and prior to occupation, the owner/client has formally committed to a tuning process for all nominated building systems including quarterly adjustments and measurement for the first 12 months after occupation and a review of building system manufacturer warranties. The scope of the tuning works will determine the relevant tuning period. The commitment from the building owner must confirm that there is a requirement for a building tuning process and responsibilities are assigned to have all nominated building systems tuned after practical completion included in the Commissioning Plan or a separate document from the building owner. The commitment must include at least the following: • O&M Manuals have been developed in accordance with approved standards and guidelines • A building tuning manual, or a building tuning plan, has been developed in accordance with the approved standards and guidelines • A building tuning team has been created including the facilities manager, the owner's representative and the ICA (if applicable). The head contractor and the services design professionals are available to address specific tuning issues where required and • The owner has engaged parties to tune the nominated systems. This engagement includes requirements for: - Verification that nominated systems are performing to their design potential at full and part load conditions; - Reviews of environmental performance against the environmental targets; - Collection of user feedback to match the system performance with the occupant's needs; - Adjustment of all the systems to account for all deficiencies discovered; and - Management, communication, and assignment of responsibilities for the tuning process within the team	1	1						X	X	X						X		
Submission Template - •Description of nominated systems to be included in the credit as per 2.2 •Description of the building tuning commitment that has been agreed. Confirm that there is a requirement for a building tuning process and responsibilities are assigned to have all nominated building systems tuned after practical completion. This commitment can be included in the Commissioning Plan or provided as a separate document from the building owner.								X	X	X						X		
Building Tuning Commitment or contract demonstrating that there is a requirement for a building tuning process as outlined in the 2.3. The relevant sections must be highlighted.				X				X	X	X								
2.4 Independent Commissioning Agent																		
This point can only be awarded if at least one of the credit requirements for 2.1, 2.2 or 2.3 has been achieved. One (1) point is awarded where an Independent Commissioning Agent (ICA) has been appointed to advise, monitor, and verify the commissioning and tuning of the nominated building systems throughout the design, tender, construction, commissioning and tuning phases. When this point is claimed, the specified commissioning requirements must be overseen by a qualified independent commissioning professional (separate from the design team) who is engaged directly by the client/building owner and reports directly to the owner (or the owner's representative). An ICA fulfils the roles of this criterion. A facilities manager employed by the client qualified in the commissioning of these systems also fulfils this criterion.	1	1														X		

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
Submission Template - Details of the independent commissioning agent and the services they will provide to the project				X												X		
CV of the Independent Commissioning Agent detailing the qualifications and experience relevant to the project.				X												X		
4. Building Information																		
4.1 Building Operations and Maintenance Information					X	X		X	X	X	X						X	
1 point is awarded where the project team can demonstrate that comprehensive building O&M information is available to the facilities management team in accordance with 4.1.1 and 4.1.2. ***4.1.1*** Operations and Maintenance Information Project teams must confirm that O&M information is provided for all nominated building systems and that the following criteria are achieved: •Appropriate content for all nominated building systems is readily available; •The appropriate user group has access to the information they require to deliver best practice environmental outcomes; and •Guidance on keeping information up–to-date is provided to facilities management in these documents. ***4.1.2*** Building Log Book The project team must develop a building log book to present to the building owner before practical completion of the project. The building log book must: •Be developed in line with CIBSE TM31: Building Log Book Toolkit; •Cover all nominated building systems; and •Include links or references to all relevant O&M information.					X	X		X	X	X	X						X	
Submission Template •List of all nominated building systems as per 2.2 •Confirmation that O&M information has been delivered to the building owner (or will be delivered by practical completion of the project) for all nominated building systems noted. •Confirmation that a building log book has been provided to the building owner (or will be delivered by practical completion of the project).	1	1			X			X	X	X	X							
The owner's project requirements (OPR) document or an equivalent document defining the nominated building systems; • Description of the basic functions, operations, and maintenance of the nominated building systems: - Description of its intended operation and maintenance requirements; and - List of what the main components are (including controls) and the importance of their efficient use • Targets for the energy and water consumptions and budgets for nominated building systems. • Description of how energy, water, and aspects of indoor environment quality are metered and monitored including meter diagram that illustrates how energy and water budgets could be confirmed in operation.					X	X		X	X	X	X						X	
Documentation confirming that the **operations and maintenance** information provided complies.					X			X	X	X	X						X	
Building log book in compliance with 4.1.2.					X			X	X	X	X						X	
4.2 Building User Information				X	X			X	X	X	X						X	

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
1 point is awarded where the project team can demonstrate that current building user information is available to all relevant stakeholders in accordance with the following requirements. ***4.2.1 Format of Building User Information*** •Digital format, available through any combination of digital signage or interactive information kiosks in high traffic public areas (e.g. building foyer, lift lobby or lift displays), induction or training material, website or intranet, or apps for mobile devices. •Must be relevant to the particular audience. This may be a tenant representative or an office manager. •Updateable and Editable by the FM team to ensure it remains current and relevant to building users throughout the life of the building. ***4.2.2 Delivery of Building User Information*** •The guides must be developed for each building and all nominated building systems in the project site. A consolidated guide can be created for a group of similar buildings represented by a 'typical' building. •All building user information must be available to the building owner and facility management at the time of practical completion of the project. It is acknowledged that ongoing tuning may require updates to building user information and its content may extend beyond practical completion of the project. •It must be made clear at the time of submission for certification how this information has been presented to the relevant audience or user group.	1	1		X	X			X	X	X	X						X	
Submission Template •List of all nominated building systems as per 2.2 •Confirmation that the format and content of Building User information complies with 4.2.1 and its delivery complies with 4.2.1.				X	X												X	
Building user information and (if required) supporting user documents or other supporting information demonstrating that building user information initiatives have been installed, are accessible to all users, and whose format and content complies with 4.2. This information may be presented through a combination of screenshots, print outs, or links to online information accessible to GBCA Certified Assessors.				X	X			X	X	X	X						X	
Confirmation from the building owner that building user information has been provided to the relevant parties and, if appropriate, is installed and is operational.				X														
5. Commitment to Performance																		
5.1 Environmental Building Performance (1 point)				X		X											X	
1 point is awarded if at least 80% of the project's GFA, excluding car parking areas, is covered by a commitment to set, measure and report on its environmental performance. A sliding scale may apply for reduced points. Compliance shall be demonstrated by providing a commitment to either: A. Set, measure and report on building performance metrics, in accordance with 5.1.1A (two of Greenhouse gas emissions; Potable water usage; Operational waste; and Indoor environment quality) OR B. Achieve a certified operational performance rating for the building, in accordance with 5.1.1B (commitment to achieve a Green Star – Performance rating or least two NABERS ratings) In addition to targeting either of these methods, the application of environmental building performance targets for different building occupancy and ownership models are defined in 5.1.2. Reporting of performance to stakeholders must be in accordance with 5.1.3.	1	1		X		X											X	
5.2 End of Life Waste Performance (1 point)				X		X											X	
1 point is awarded where at least 80% of the project's GFA, excluding car parking areas, has a formal commitment in place to reduce demolition waste at the end of life of an interior fitout or base building component. A smaller proportion of compliant space may be rewarded partial points on a sliding-scale to one decimal point. Compliance shall be demonstrated by providing a commitment to either: A. Establish contractual agreements, in accordance with 5.2A; or B. Achieve a certified operational performance rating for the building, addressing waste from refurbishments in accordance with 5.2B.				X		X											X	
Submission Template - Summary of how the project meets the credit criteria.	1	1															X	

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
Area Schedule listing the areas of each of the relevant formal commitments entered into.				X		X											X	
Formal Agreements that describe the stakeholders, targets and duration of agreements or copies of other formal commitment devices. Contractual agreements must be in place to demonstrate the credit criteria. Compliance requirements are provided for the following building occupancy and ownership models: • Building Owner and Tenants; • Building Owner/Occupier; and • Strata Management for multi-unit residential.				X														
Green Star – Performance credit documentation where applicable.				X													X	
NABERS rating documentation where applicable.				X													X	
6. Metering and Monitoring																		
6.0 Metering strategy (must be met to achieve points under 6.1)	CR	P			X			X	X	X						X	X	
To qualify for points under this credit it is a conditional requirement that accessible metering be provided to monitor building energy and water consumption, including all energy and water common and major uses, and sources					X			X	X	X						X	X	
6.1 Monitoring strategy	1	1			X			X	X	X						X		
1 point is available where a monitoring strategy is addressed through a monitoring system, capable of capturing and processing the data produced by the installed energy and water meters, and accurately and clearly presenting data consumption trends					X			X	X	X						X		
Submission Template -Selection of which criteria the project meets the credit criteria -Summary of how the project meets the credit criteria					X											X	X	
Drawings showing the location of all energy and water meters in the project and the associated energy and water uses; showing how the system is easily accessible to the residents; and confirming the					X			X	X	X								
Extracts from Commissioning Report where relevant, showing the automatic monitoring system is operating and has the ability to provide the information required in the Compliance Requirements.					X											X		
Copy of Monitoring Strategy document specific to the building and including detail described in the Compliance Requirements section of the credit.					X			X	X	X						X		
Automatic monitoring system data sheet describing the systems features and capabilities. In particular, it must describe the system's ability to analyse metering information at regular intervals, i.e. on a daily, weekly, and monthly basis.					X			X	X	X						X		
7. Construction Environmental Management																		
7.0 Environmental Management Plan (must be met to achieve points under 6.1)	CR	✓			X													
The conditional requirement is met where a comprehensive project-specific Environmental Management Plan (EMP) is in place for construction					X													
7.1 Formalised Environmental Management System	1	1			X													
1 point is available where a formalized systematic and methodical approach to planning, implementing and auditing, is in place during construction, to ensure conformance with the EMP					X													
Submission Template •Description of Environmental Management Plan scope. •Compliance matrix showing how the requirements of the NSW Environmental Management System Guidelines will be fulfilled.					X													
Environmental Management Plan (EMP), clearly demonstrating compliance with the requirements of the NSW Environmental Management System Guidelines.					X													
Confirmation of subcontractor adherence to the EMP requirements that any subcontractors relevant to the project adhered to the EMP provisions at the time of construction works. This may be through a confirmation from the Principal/Head Contractor, or through a policy document stating the process					X													

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Contractor Formalised Management System (EMS) External Auditor's report confirming formalised management system was in place and operational at the time of construction works.					X													
Contractor ISO 14001 certificate showing the date of issue prior to the commencement of construction works.					X													
Inspection Reports from EMS showing that site audits took place as per the EMS and that conformity was verified. Where nonconformity is found, audit records need to show corrective or preventive actions taken.					X													
8. Operational Waste																		
8B Prescriptive Pathway: Facilities 1 point is available where facilities are in place to collect and separate distinct waste streams, and where these facilities meet best practice access requirements for collection by the relevant waste contractor.					X	X												
8B.1 Separation of Waste Streams Collection bins or storage containers shall be provided for building occupant use that allow for separation of all applicable waste streams. The following waste streams must be provided with separate bins or containers: General waste; Paper and cardboard; Glass; Plastic; and At least one other waste stream					X	X												
8B.2 Dedicated Waste Storage Area A dedicated sufficiently sized area for the storage and collection of the applicable waste streams, shall be provided. The storage area must be sized to accommodate all bins or containers, for all applicable waste streams, for at least one collection cycle. The calculations used to demonstrate that the area provided is adequately sized to handle the recyclable waste streams specified must be based on: Waste generated by project; and Collection frequency for each waste stream. The calculations for waste generation rates must be based on figures outlined within third-party best practice guidelines. It is acceptable to provide more than one dedicated storage area when providing the appropriate waste storage space for the project. However, all storage areas dedicated to recycling must meet all the applicable requirements.	1	1			X	X												
8B.3 Access to Waste Storage Area Access requirements for waste collection areas must adhere to best practices in order for this credit to be met. These access arrangements must be as outlined within third-party best practice guidelines.					X	X												
Submission Template - Summary of how the project meets the credit criteria					X	X												
Site and/or architectural plans highlighting all relevant areas demonstrating compliance with credit criteria					X	X												
INDOOR ENVIRONMENT QUALITY	15																	
9. Indoor Air Quality																		
There are 3 parts to this credit: 9.1 Ventilation System Attributes 9.2 Provision of Outdoor Air 9.3 Exhaust or Elimination of Pollutants	-	-						X										
9.1 Ventilation System Attributes								X										

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1 point is available where project teams can demonstrate that the ventilation system meets all of the following conditions; · The entry of outdoor air pollutants is mitigated, in accordance with 9.1.1; AND · The system is designed for ease of maintenance and cleaning, in accordance with 9.1.2; AND · The system has been cleaned prior to occupation and use, in accordance with 9.1.3. Where construction management processes are in place to ensure that all new ductwork, or ductwork that has been recently cleaned, remains free of moisture and debris until occupation, this ductwork can be considered to be clean. All other ductwork (existing and new) including plenums, filters and fan chambers must be cleaned in accordance with the recognised Standards.	1	1						X										
9.1.1 Entry of Outdoor Pollutants The building services must be designed to comply with ASHRAE Standard 62.1:2013 in regards to minimum separation distances between pollution sources and outdoor air intakes. Compliance is to be demonstrated in accordance with the distances specified in Table 5.5.1 of the Standard.								X										
9.1.2 Design for Ease of Maintenance and Cleaning Any mechanical ventilation system within the building, whether existing or new, must be designed to provide adequate access for maintenance, to both sides of all moisture and debris-catching components, within the air distribution system.								X										
9.1.3 Cleaning Prior to Use and Occupation All new and existing ductwork that serves the building must have been cleaned in accordance with the recognised Standards. See the Guidance section or contact WSP for a list of recognised Standards. If no ductwork exists, these requirements are deemed to be met.								X										
9.2 Provision of Outdoor Air								X										
2 points are available where the nominated area is provided with sufficient outdoor air to ensure levels of indoor pollutant are maintained at acceptable levels. For mechanically ventilated, or mixed-mode spaces: • 1 point is awarded where outdoor air is provided at a rate 50% greater than the minimum required by AS 1668.2:2012, or CO2 concentrations are maintained below 800ppm; or • 2 points are available where outdoor air is provided at a rate 100% greater than the minimum required by AS 1668.2:2012, or CO2 concentrations are maintained below 700ppm. For naturally ventilated spaces, 2 points are awarded where the requirements of AS 1668.42012 are met. The nominated area must be provided with a quantity of outdoor air appropriate for the activities and conditions in the space.								X										
9.2A Comparison to Industry Standards Outdoor air must be provided to each space in the nominated area at a rate greater than the minimum required by AS 1668.2:2012 or ASHRAE 62.1:2003 by the stipulated percentage increase.								X										
9.2B Performance based approach The system must be capable of providing enough outdoor air to maintain CO2 levels at, or less than, the stipulated thresholds within each space. The system must then adjust the amount of outdoor air to each space up to the maximum (design) outdoor air quantity to ensure that CO2 levels are maintained below the stipulated ppm threshold. Zoning the system: CO2 sensors shall be located so that they provide accurate representative readings of the CO2 concentrations in occupied spaces. A sensor shall be installed in each enclosed space. At a minimum, CO2 sensors shall be located with and as regularly as temperature sensors and monitor an area no greater than 500m2 Modifying the air quality threshold: The nominated CO2 threshold are applicable to most spaces. If appropriate, the project may nominate alternative thresholds from ASHRAE 62.1. The justification must be accompanied with documentation from a recognised standard or peer reviewed research.	2	1						X										

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9.2C Natural Ventilation The space in the nominated area must be provided with good access to outdoor air, appropriately for the activities and conditions in the space. When naturally ventilated, the space must meet the requirements of AS 1668.4-2012. If any mechanical ventilation, other than ceiling fans, is present then the space cannot be considered naturally ventilated. Projects must justify how the nominated area will perform as a naturally ventilated space, under all likely weather conditions.								X										
Submission Template •Where the 'Provision of Outdoor Air' criterion is claimed: - Description of the system in place, occupancy rates, and how each space is provided with sufficient outdoor air; and - Description of any modelling (if relevant) to ensure the CO2 level threshold is maintained.					X			X										
9.3 Exhaust or Elimination of Pollutants	1	1						X										
1 point is available where nominated pollutants, such as those arising from printing equipment, cooking processes and equipment, and vehicle exhaust, are limited by either removing the source of pollutants from the nominated area, or exhausting the pollutants directly to the outside while limiting their entry into other areas of the project								X										
9.3A Removing the Source of Pollutants Sources of pollutants (printing or photocopy equipment, kitchen stoves or vehicles) must be compliant with minimum emissions standards or not be present within the nominated area. Where printing and/or photocopying equipment is present, all printing or photocopying equipment located throughout the project must be certified in accordance with one of the following test methodologies: ECMA-328, RAL-UZ 122 or GGPS.003. The test certificate must state the emission limits specified in Table 9.3.1, and issued by NATA accredited or ISO 17025 accredited laboratories (refer to tab IEQ-9.3A)								X										
9.3B Exhausting the Pollutants Directly to the Outside For spaces that are affected by all other pollutant sources, any sources of pollutants shall be exhausted directly to the outside of the project in accordance with a recognised Standard; and/or physically separated from occupants. ***9.3B.1 Printing and Photocopying Equipment*** All print and photocopy equipment must be located in an enclosed print/photocopy area that is exhausted directly to the outside, or to a dedicated exhaust riser. The exhaust system must not recycle air to other building enclosures, or to the return air duct of the ventilation system. In shell and core buildings, the provision of the exhaust facility without enclosure will suffice, provided that guidance to the tenant is developed to ensure appropriate installation. Each print/photocopy room must achieve a minimum exhaust ventilation flow rate in accordance with AS 1668.2-2012 (Table B1). The exhaust facility must be a dedicated exhaust facility and exhausted air shall not be recycled to other enclosures. The fans must be installed as part of the base building; provision of the fans for future installation (e.g. by a tenant) does not meet the credit criteria. The project must demonstrate compliance regardless of delivery as a shell and core or integrated fitout project.								X										
Submission Template -A description of the building's ventilation systems -Description of nominated areas as per 2.2 •Where the 'Exhaust or Elimination of Pollutants' criterion is claimed: - Describing the attributes of the ventilation system or other methods to ensure compliance which are designed to exhaust relevant pollutant sources. •A description of how air intakes are located away from specific potential outdoor contaminants and are designed to minimise the entry of pollutants to occupied spaces in accordance with ASHRAE 62.1:2013. •A description of how the system was designed for ease of maintenance and cleaning.								X										

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Mechanical drawings for each ventilated space.								X										
Extract from the ventilation system specification for each system, the project's commissioning requirements are stated in accordance with the relevant codes/guideline. The relevant sections must be highlighted.								X										
Extract from the Commissioning Report demonstrating that the HVAC and CO2 monitoring systems are operating as intended. For naturally ventilated areas, this is only relevant where automation systems and the like are included.					X			X								X		
Extract from the printing and photocopy specification outlining the product certification criteria for all printing or photocopy equipment located throughout the project.					X	X		X										
Certificates for printing equipment to ACMA 328, RAL-UZ 122 or GGPS.003 for all printing equipment which is included in the fitout.					X	X		X										
10. Acoustic Comfort																		
10.1 Internal Noise Levels															X			
One (1) point is awarded where project teams demonstrate that internal ambient noise levels in the nominated area is no more than 5dB(A) above the "satisfactory" sound levels provided in Table 1 of AS/NZS 2107:2000. The noise measurement and documentation must be provided by a qualified acoustic consultant in accordance with AS/NZS 2107:2000. Noise measurement must account for all internal and external noise sources when the space is unoccupied but ready for occupancy. All steady state, or quasi steady state, noise sources shall be included. This includes building services equipment noise, noise emission from outdoor sources such as traffic, and (where known) noise from any noise generation process. When compliance is demonstrated through measurement at the time of commissioning, the measurements shall be conducted in at least 10% of the spaces in the nominated area. The range of measurement locations shall be representative of all the spaces available within the nominated area. The acoustic consultant in also required to justify the detailing and joints between partitions and ceilings and the impact on performance of noise carriage.	1	1													X			
10.3 Acoustic Separation															X			
1 point is available where the nominated enclosed spaces have been built to minimise crosstalk between rooms and between rooms and open areas following 10.3A or 10.3B ***10.3A*** The Partition between spaces should be constructed to achieve a weighted sound reduction index (Rw) of at least 45. ***10.3B*** The sound insulation between enclosed spaces complies with Dw + LAeqT > 75 Dw Weighted sound level difference between two spaces LAeqT Indoor ambient noise level in the space adjacent to the enclosed space The sound tests from which DW is derived must be measured in accordance with ISO 140-4:1998. Measurements must be based on finished rooms, accounting for any carpets and acoustically absorbent ceilings specified. The measurements can be conducted in either furnished or unfurnished spaces.	1	1													X			
Submission Template •Description of all relevant internal and external noise sources. •Description of the design features that ensure the credit criteria have been met. •Measured noise levels in all relevant spaces and the noise levels required to meet the credit criteria. •If the building is mechanically ventilated, confirmation that the plant was fully in operation when the tests were carried out.															X			
Detailed Drawings detailing the acoustic design features relevant to this credit.															X			
Report by a qualified acoustics consultant confirming credit compliance.															X			

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Extracts from the commissioning report detailing relevant measured noise levels and target noise levels.					X										X	X		
11. Lighting Comfort																		
11.0 Conditional Requirement					X	X			X									
It is a minimum requirement of this credit that all lights in the nominated area are flicker-free and accurately address the perception of colour in the space. Flicker-free lighting refers to luminaires that have either: • A minimum Class A1 & A2 ballast; • High frequency ballasts for all fluorescent lamps; or • Electronic ballasts in High Intensity Discharge (HID) lighting. To address the perception of colour, all light sources must have a minimum Colour Rendering Index (CRI) of 80, unless the project team can demonstrate that, in a particular area, the activity is not impeded by a lower CRI. The project team shall support their justification by ensuring their selection complies with the guidance provided in Table 7.2 in AS 1680.1:2006.	CR	✓							X									
11.1 General Illuminance and Glare Reduction									X									
One (1) point is awarded where in the nominated area, lighting levels comply with best practice guidelines and glare is eliminated in accordance with the requirements under 11.1.1 and 11.1.2.									X									
11.1.1 General Illuminance Best practice lighting levels for each task within each space type is defined as lighting with a maintained illuminance that meets the levels recommended in the relevant Standard. Guidance for different space types and activity types are listed in Table 11.1.1. under tab IEQ-11. The maintained illuminance level shall be calculated on an area-weighted average for each distinct space. Compliance with this credit can be demonstrated through modelling of the whole building or a representative floor or section, or using measurements. These must be carried out in accordance with Appendix B of AS 1680.1:2006. The maintained Illuminance values must achieve a uniformity of no less than that specified in Table 3.2 of AS 1680.1:2006, with an assumed standard maintenance factor of 0.8. Where maintained illuminance values for a particular space are not specified, the values to be used must relate to the closest type of task as defined in AS 1680.1:2006 Table 3.1. Residential Spaces For residential spaces, the point will be awarded where in living spaces, kitchen, bathrooms and bedrooms: • The lighting design includes or permits general fixed lighting that provides good maintained illuminance values for the entire room; and • The installed fittings all have fittings with rated colour variation not exceeding 3 MacAdam Ellipses (decorative fittings being exempt).	1	1							X									
11.1.2 Glare Reduction Glare from lamps must be limited from the nominated area. Three options are provided for demonstrating compliance with this requirement, including a performance method, and two prescriptive methods. A combination of methods can be used to demonstrate compliance.					X				X									
Option 11.1.2A Prescriptive Method All bare light sources must be fitted with baffles, louvers, translucent diffusers, ceiling design, or other means that obscures the direct light source from all viewing angles of occupants, including looking directly					X				X									
Option 11.1.2B Prescriptive Method For uniform lighting solutions, the lighting system complies with the Luminaire selection system as detailed in section 8.3.4 of AS1680.1-2006"					X				X									
Option 11.1.2C Performance Method The Unified Glare Rating (UGR) calculated for the lighting on a representative floor must not exceed the maximum values listed in Table 8.2 of AS 1680.1-2006 The UGR rating must be calculated in accordance with the procedure outlined in Section 8.3.3 of AS					X				X									
11.2 Surface Illuminance					X	X			X									

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One (1) point is awarded in the nominated area, a combination of lighting and surfaces improve uniformity of lighting to give visual interest. There are two options provided for demonstrating compliance with this requirement, a prescriptive method and a performance method. A combination of both methods is acceptable for demonstrating compliance. For residential spaces, only Option 11.2.C is applicable.					X	X			X									
Option 11.2.A Prescriptive Method All the spaces in the nominated area must have: - An average surface reflectance for ceilings of at least 0.75; and - A direct/indirect lighting system is present such that the ceiling area has an average surface illuminance of at least 30% of the lighting levels on the working plane. The average surface reflectance value of 0.75 corresponds to a matte flat white ceiling. The surface reflectance value for the final finish must be obtained from the manufacturer's data sheet. At least 90% of the ceiling must have this finish. Small amounts of light fittings or items can be disregarded.	1	1			X	X												
Option 11.2.B Performance Method All the spaces in the nominated area must be modelled to show that: - The average ceiling luminance (excluding light fixtures) does not exceed 0.5 kcd/m2 and the maximum luminance at any point on the ceiling does not exceed 1.5 kcd/m2; - The ceiling area has an average surface illuminance of at least 30% of the lighting levels on the working plane; and - In rooms less than 100m2, or in rooms where more than 20% of workstations are located within 3m of walls; the wall area above the working plane has an average surface illuminance of at least 50% of the lighting levels on the working plane. The illuminance values for ceilings, walls, and floors must be calculated in accordance with AS/NZS 1680.1:2006 Appendix B. The material and reflectance values used must correspond to the installed items. Where these are not					X				X									
11.3 Localised Lighting Control						X			X									
1 point is available where, in the nominated area, occupants have the ability to control the lighting in their immediate environment.						X			X									
One (1) point is awarded where project teams can demonstrate that, in the nominated area, occupants have the ability to control the lighting in their immediate environment. This includes turning the lights on and off and adjusting their light levels. One light can be controlled by one or more individuals, however, the project team must justify why and how, this is conducive to localised control. It is essential for project teams to identify what the 'immediate environment' is. For example, in an open-plan office the immediate environment is the light shone on the workstation; in a residential unit it is the light hitting the work surface in the kitchen where food is prepared.	1	1				X			X									
Submission Template •Description of nominated areas •A description of how the following criteria have been met -Flicker-free lighting -Accurate Colour -General Illuminance -General Glare Reduction -Surface Illuminance -Individual Control						X			X									
Lighting Drawings						X			X									
Lighting Specifications/Schedules						X			X									
Product Data Sheets						X			X									
Isolux Plot Drawings									X									
Architectural Drawings						X												
12. Visual Comfort																		
12.0 Glare Reduction					X													

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The conditional requirement is met where the glare in the nominated area from sunlight through all viewing facades is reduced through a combination of blinds, screens, fixed devices, or other means. Residential Projects Where it is expected that blinds will be installed by the occupiers of residential units, these spaces are excluded from this minimum requirement. Three options are provided (12.0A, 12.0B and 12.0C) and a combination of the methods outlined can be used to demonstrate compliance with this minimum requirement.	CR	✓			X	X												
12.0A Fixed Shading Devices For this option fixed devices must be shown to shade the nominated plane 1.5 meters in from the centre of the plane of the viewing facade. The nominated plane must be shown to be shaded from direct sunlight for 80% of the nominated hours for each day of the winter and spring equinoxes and the summer and winter solstices.					X	X												
12.0B Blinds or Screens All blinds or screens in the nominated area must meet the following criteria: - The blinds must provide glare reduction to at least 95% of area to all viewing planes; - Blinds must be controlled by all affected occupants within each space; and - Blinds must have a visual light transmittance (VLT) of less than or equal to 10%. Manual or automated internal, in-glazing, or external blinds can be used. Where automated blinds are used, they must be controlled either by a management system or by a manually=activated switch. All automated blinds and screens must be equipped with a manual override function accessible by occupants in each of the adjacent spaces served.					X	X												
12.1 Daylight	2	1															X	
Up to 2 points are available where a percentage of the nominated area receives high levels of daylight during 80% of the nominated areas 40% Nominated Area – 1 point 60% Nominated Area – 2 points																	X	
12.1A Prescriptive Method The daylight access is determined using manual calculations for simple designs. There must be negligible overshadowing of glazed areas and separate calculations must be provided for each space. Refer to the GBCA Green Star Daylight Hand Calculation Guide for further guidance.																	X	
12.1B Compliance using Daylight Factor A specified proportion of the nominated area must be shown to have a Daylight Factor (DF) of at least 2.0% at finished floor level (FFL) under either a CIE overcast sky, or a CIE uniform sky.																	X	
Submission Template •Description of nominated areas •Description of nominated hours •Description of how the project meets the requirements for daylight						X											X	
Daylight modelling report showing the daylight factor or daylight illuminance for the claimed spaces and including the following information: •A summary table showing each space or floor, their nominated area, and the compliant area in both square meters and as a percentage basis. •The daylight model showing the amount of floor area that is compliant, and the daylight values.																	X	
Manual calculations showing: •The amount of floor area that is compliant for daylight. •The amount of compliant area for views. •The height and length of windows and any area of any skylights. •The lines-of-sight showing that no obstructions exist. •Any internal features or showing that no obstructions exist externally																	X	
12.2 Views																	X	

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One (1) point is available where project teams can demonstrate that at least 60% of the nominated area has a clear line-of-sight to a high quality internal or external view. All floor areas within 8m from a compliant view can be considered to meet this credit criterion. The line-of-sight shall be measured by extending a perpendicular line from the view, be it a window, opening or internal view. A line at 45° can be used at the corners of the view. The thickness of the external walls must be taken into account in the calculations. Internal or external columns can be ignored. Refer to the GBCA's Green Star Daylight and Views Hand Calculation Guide for further guidance.	1	1				X											X	
Submission Template •Description of nominated areas •Description of nominated hours •Description of how the project meets the requirement for glare reduction •Description of how the project meets the credit requirements for views																	X	
Drawings showing: •The location of all blinds / shutters. •Any glare control devices.					X	X												
Drawings showing access to views					X	X											X	
13. Indoor Pollutants																		
13.1 Paints, adhesives, sealants and carpets					X	X		X	X	X	X							
One (1) point is awarded where project teams demonstrate that either no paints, adhesives, sealants or carpets are used in the nominated spaces, or at least 95% of all internally applied paints, adhesives, sealants or carpets meet the total VOC limits specified in 13.1.1 and 13.1.2 as applicable. Refer to tab IEQ-13 for VOC limits.					X	X		X	X	X	X							
13.1.1 Paints, Adhesives, and Sealants This requirement is applicable to all internal applications of all types of paints, adhesives or sealants applied on-site, including both exposed and concealed applications. If exterior grade products are used in an internal application then these must also meet the requirements. The following items are excluded from this credit: · Glazing film, tapes, and plumbing pipe cements; · Products used in car parks; · Paints, adhesives and sealants used off-site, for example applied to furniture items in a manufacturing site and later installed in the fitout; and · Adhesives and mastics used for temporary formwork and other temporary installations. Total VOC (TVOC) values must reflect the final ready to use product, inclusive of tints (in the case of paints) and made in grams of VOC per litre (g/L) of ready to use product. Paints adhesives or sealants TVOC limits are detailed in tab IEQ-13. Most adhesives and sealants are addressed in the 'General purpose adhesives and sealants' category of the table, unless they clearly					X	X		X	X	X	X							
13.1.2 Carpets There are two methods for demonstrating that a carpet complies. A combination of 13.1.2A and 13.1.2B can be used to demonstrate compliance.	1	1			X	X		X	X	X	X							
13.1.2A Product Certification The product is certified under a recognised Product Certification Scheme (listed on the GBCA web site) or other recognised standards. The certificate must be current at the time of project registration or submission and list the relevant product name and model.					X	X		X	X	X	X							
13.1.2B Laboratory Testing The product complies with the Total VOC (TVOC) limits specified in tab IEQ-13 for VOC limits.					X	X		X	X	X	X							

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Submission Template •Summary of how credit compliance has been achieved i.e. confirm that: - At least 95% of all internally applied paints, adhesives, sealants and carpets meet stipulated 'Total VOC Limits', or where no paints, adhesives, sealants or carpets are used in the building.					X	X		X	X	X	X							
Submission Template •Summary of how credit compliance has been achieved •List of all products relevant and how they comply with the credit criteria.					X	X		X	X	X	X							
Specifications that demonstrate emission levels					X	X		X	X	X	X							
Material Safety Data Sheets that demonstrate the compliant emission levels **Product certificates** that demonstrate emission levels **Product certificates** that demonstrate certification under a recognised product certification scheme or recognised standard **Product data sheets** that demonstrate emission levels **Invoices and proof of purchase** to demonstrate costs of compliant materials.					X	X		X	X	X	X							
Bill of Quantities from Quantity Surveyor or Cost planner, demonstrating material costs					X													X
13.2 Engineered wood products	1	1			X	X												
One (1) point is available where at least 95% of all engineered wood products meet stipulated formaldehyde limits or no new engineered wood products are used in the building. Engineered wood products include particleboard, plywood, Medium Density Fibreboard (MDF), Laminated Veneer Lumber (LVL), High-Pressure Laminate (HPL), Compact Laminate and decorative overlaid wood panels. Timber veneers are excluded. Where only part of a product is composed of an engineered wood product, the limits apply only to that portion of the product, not the entire item. The following applications of engineered wood products are excluded from this credit: · Formwork; · Car park applications; and · Non-engineered wood products such as milled timber. All engineered wood products used in the building must meet the relevant limits specified in Table 13.2 under tab IEQ-13 for VOC limits as per the specified test protocol, or have product specific evidence that it contains no formaldehyde.					X	X												
Submission Template •Summary of how credit compliance has been achieved - At least 95% of all engineered wood products meet stipulated formaldehyde limits or no new engineered wood products are used in the building.					X	X												
Submission Template •Summary of how credit compliance has been achieved •List of all products relevant and how they comply with the credit criteria.					X	X												
Specifications that demonstrate formaldehyde contents.					X	X												
Material Safety Data Sheets that demonstrate the compliant formaldehyde content **Product certificates** that demonstrate formaldehyde contents. **Product certificates** that demonstrate certification under a recognised product certification scheme or recognised standard **Product data sheets** that demonstrate formaldehyde contents. **Invoices and proof of purchase** to demonstrate costs of compliant materials.					X	X												
Bill of Quantities from Quantity Surveyor or Cost planner, demonstrating material costs					X													X
14. Thermal Comfort																		
14.1 Thermal Comfort						X											X	

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
1 point is available where a high degree of thermal comfort is provided to occupants in the space, equivalent to 80% of all occupants being satisfied in the space. One (1) point is awarded where project teams demonstrate that, for 95% of the nominated area and 98% of the year, a high degree of thermal comfort is provided as follows: Naturally ventilated spaces – The internal temperatures in each space are within 80% of Acceptability Limit 1 of ASHRAE Standard 55-2013, in accordance with 14.1.1; Mechanically ventilated spaces – The space meets specified prescriptive criteria for Thermal Comfort or the Predicted Mean Vote (PMV) levels are between -1 and +1, inclusive, in accordance with 14.1.2						X											X	
Submission Template •A summary of the thermal comfort modelling report or calculations for the building. •A description of: -How the space meets the acceptability limits; and / or - A summary of the thermal comfort calculations for the project design and demonstrating that the PMV targets are achieved; and / or - Details of all of the HVAC Design and Building Fabric Performance criteria of the DTS approach.	1	1															X	
Submission Template •A summary of how each of the above criteria has been met: - A description of the methodology, weather data, and software package used for determining the thermal comfort levels. - A description of the HVAC system, and including details of temperature, humidity, air rates, infiltration rates, control and zoning strategy. - The internal loads used, the usage profiles, the clothing, metabolic rate, and air movement values used,																	X	
Drawings showing thermal properties of roof, windows, and façade.						X												
Mechanical drawings showing details of the HVAC system and zones.								X										
Modelling reports showing the results of the relevant criterion.																	X	
Confirmation from the relevant sub-contractors that all services have been installed and commissioned in line with the listed DTS criteria.					X											X		
Extract(s) from the Commissioning Report demonstrating via commissioning results that the building has been commissioned and installed systems operate as intended					X											X		
ENERGY	22																	
15. Greenhouse Gas Emissions																		
15E Perfomance Pathway					X	X		X	X	X			X				X	
15E GHG Emissions Reduction – Modelled Performance Pathway - Credit Requirements (Reference Building Pathway) Up to 20 out of 20 points are available where it is demonstrated that there is a specified reduction in the predicted energy consumption and GHG emissions of the proposed building. Points are awarded based both on improvements to the building's façade, and on the project's predicted ability to reduce its energy consumption and emissions towards net zero.	Rating CR	✓			X	X		X	X	X			X				X	
15E.0 GHG Emissions Reduction – Modelled Performance Pathway - Conditional Requirements Project teams must demonstrate that the Proposed Building greenhouse gas (GHG) emissions are less than those of the equivalent Benchmark Building. The Benchmark Building represents a 10% improvement on the Reference Building. The Reference Building is a building which achieves minimal compliance with the NCC Section J DTS provisions.					X	X		X	X	X			X				X	
15E.1 Credit Requirements					X	X		X	X	X			X				X	
Up to 4 points are awarded for Energy Consumption Reduction (intermediate building relative to reference building). Up to 16 points are awarded for GHG Emissions Reduction (Proposed Building relative to Benchmark Building).					X	X		X	X	X			X				X	

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Submission Template •Summary of how the project meets the credit criteria.																	X	
Energy modelling report: •Clearly identifying all default values used (e.g. occupant density). •Clearly identifying all of the assumptions made, design-driven inputs and referencing drawings; whenever assumptions are used, they must be justified and conservative. •Clearly corresponding to the design.																	X	
Extract(s) from the specification(s) demonstrating that all the inputs used in the energy simulation are reflected in the current design.						X		X	X	X			X				X	
Extract(s) from the Commissioning Report demonstrating (through supporting evidence) that the building has been commissioned and operates as intended by the design (i.e. as described in the energy	20	14.4			X											X	X	
As built drawings demonstrating that the facade details and materials are the same as described in the energy modelling report.					X	X		X	X	X								
For mixed mode ventilated spaces, drawings for each space clearly showing openings and dimensions of ventilation inlets and outlets.						X		X										
Shared Services - Procurement Contract Approach This credit allows projects with shared energy supplies to be rewarded for a reduction in GHG emissions. The intent of this approach is to also reward buildings which connect to low-carbon energy sources at a utility-scale, rather than only rewarding those projects which produce low-carbon energy on-site. This approach is intended to cover the procurement opportunities for energy and utility systems, including the following: •District thermal networks. •Shared combined heat and power systems. •Private wire networks with embedded renewable energy. •Grid connected low-carbon energy (e.g. biomass or biogas systems).				X	X												X	
Power Purchase Agreement (PPA) and Thermal Power Purchase Agreements identifying the duration of the power supply contract, supply availability (including proportion of GreenPower) and guaranteed GHG emission factor.				X	X												X	
16. Peak Electricity Demand Reduction																		
16.B Modelled Performance Pathway: Reference Building	2				X	X		X	X	X			X				X	
Up to 2 points are available where it is demonstrated that the project's predicted peak electricity demand has been reduced below that of a 'Reference Building': • 0-10%: 0 point • 20%: 1 point • 30%: 2 points					X	X		X	X	X			X				X	
Submission Template •Details about how each criterion has been achieved.	2	1															X	
Completed Green Star – Design & As Built Energy Calculator																	X	
Energy modelling report																	X	
Extract(s) from the Commissioning Report that specifically highlight the systems which contribute towards the peak electricity demand reduction, and demonstrate that they have been commissioned and operate as intended by the design (i.e. as described in the energy modelling report).					X											X		
TRANSPORT	10																	
17. Sustainable Transport																		
17B Prescriptive Pathway					X												X	
Up to 7 points out of 10 are available where reduced carbon emissions from transport and increased active transport mode of participation are demonstrated using specified prescriptive criteria.																		

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
17B.1 Access by Public Transport Up to 3 points are available based on the accessibility of the site by public transport.																		
Submission Template •The number of regular occupants expected for the project •Results from the Green Star – Design & As Built Access by Public Transport Calculator •The WalkScore or the project or a summary of the number of amenities within the relevant distance to the site	3	2			X												X	
Green Star – Design & As Built Access by Public Transport Calculator																	X	
17B.4 Active Transport Facilities 1 point is available where bicycle parking and associated facilities are provided to regular occupants and visitors. Please contact WSP for more information.																	X	
Submission template •The number of regular occupants expected for the project •The number of bicycle parking spaces that have been provided and the number that are required for credit compliance •A description of the secure bicycle spaces and end of trip facilities (i.e. showers and lockers	1	1			X												X	
Project Drawings showing the proposed car parking spaces, bicycle parking spaces, and end-of trip facilities.						X											X	
17B.5 Walkable Neighbourhoods 1 point is available where the project is located conveniently to amenities or the project achieves a specified walk score	1	1															X	
WalkScore Report																	X	
WATER	12																	
18. Potable Water	12																	
18A Potable Water – Modelled Performance Pathway					X	X				X							X	
18A Potable Water Up to 12 points are available based on the magnitude of the predicted reduction in potable water consumption, when the project is compared against a reference building. Up to twelve (12) points are awarded where it is demonstrated that the building's predicted potable water consumption has been reduced below that of a Reference Building. This credit addresses the potable water consumption from the use of sanitary fixtures, appliances, HVAC, irrigation systems, and swimming pools (where present). See Table 18A.1 The Compliance Requirements and guidance for the Performance Pathway are detailed in the Green Star Potable Water Calculator Guide. Points achieved by the Performance Pathway are determined in accordance with the Green Star Potable Water Calculator. Shared Services This credit rewards projects for reduction in potable water usage due to the use of reclaimed water from on-site rainwater, greywater, Blackwater, stormwater or supplied reclaimed water. The calculator allows for the inclusion of the amount of non-potable water that is available from a central or shared service for use within the building.	12	6			X	X				X							X	
Submission Template •Summary of how the project meets the credit criteria. •Details about how each criteria has been achieved. •Supporting Documentation, outlined below (as applicable)						X				X								
Completed Green Star – Design & As Built Potable Water Calculator										X							X	
WELS certificates for all toilets, urinals, taps, showers, dishwashers, and residential-scale laundry equipment					X	X												
Manufacturer's data for commercial-scale laundry equipment, should be submitted in lieu of WELS certificates.					X	X												

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
Drawing(s) clearly showing the location of all heat rejection equipment installed on the project								X		X								
Drawings showing the landscape design and the irrigation system, listing the name, location, and plant species zone as it appears in the Calculator.						X	X											
Drawing(s) for each typical floor showing isolation valves for floor-by-floor testing of the fire sprinkler system, and drawings of the water storage and re-use system(s).										X	X							
Manufacturer's information showing that the application efficiency for the landscape irrigation system.						X	X											
Drawing(s) of process cooling water usage loops.								X		X								
MATERIALS	14																	
19. Life Cycle Impacts	12																	
Prescriptive Pathway	5				X							X						
19B.1.1 Portland Cement Up to 2 points are available where the Portland cement content in all concrete used in the project has been reduced by replacing it with supplementary cementitious materials. 1 point is available where the Portland cement content is reduced by 30%, measured by mass across all concrete used in the project compared to the reference case: OR 2 points are available where the Portland cement content is reduced by 40%, measured by mass across all concrete used in the project compared to the reference case. There are 8 points available between the options in this pathway. However, only a maximum of 5 can be awarded.	2	1			X							X						
Submission Template • Description of the uses of concrete in the building • Summary of the concrete mixes used in the building and the volume used • Summary of the amounts of recycled aggregates and recycled water included in the concrete mix					X							X						
19B.2A Reduced Mass of Steel Framing (Steel framed building) 1 point is available when there is a reduction in the mass of steel framing used when compared to standard practice. There are 8 points available between the options in this pathway. However, only a maximum of 5 can be awarded.	1	1			X							X						
19B.2B Reduced Use of Steel Reinforcement (Concrete framed building) 1 point is available when there is a reduction in the mass of steel reinforcement used when compared to standard practice. There are 8 points available between the options in this pathway. However, only a maximum of 5 can be awarded.																		
Submission Template • Confirmation of whether the project is targeting Steel Framed Criteria or Reinforcement Criteria • Summary and percentages of high-strength steel used • Summary of reduction of mass of structural steel • Summary of reduction of mass of reinforcing steel					X							X						
20. Responsible Building Materials	3																	
20.1 Steel																		
1 point is available where 95% of the building's steel is sourced from a Responsible Steel Maker; and • For steel framed buildings, at least 60% of the fabricated structural steelwork is supplied by a steel fabricator/steel contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute (ASI); or • For concrete framed buildings, at least 60% (by mass) of all reinforcing bar and mesh is produced using energy-reducing processed in its manufacture (measured by average mass by steel maker annually).					X							X						

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
Submission Template •Total mass of steel used in the building •Details of steel that has been sourced from a responsible steel maker •Details of steel that have been supplied by a responsible steel fabricator •% of steel reinforcement that has been produced by energy-reducing processes	1	1			X							X						
Structural drawings												X						
Structural Specifications												X						
Steel Producer's ISO14001 certificate					X							X						
Steel Producer's WSA CAP certificate					X							X						
Details of Steel Fabricators membership of ASI Environmental Sustainability Charter					X							X						
Energy-Reducing Processes Report from every reinforcing steel maker, explaining the energy-reducing processes used in their steel making process and confirming that it is used in the production of at least 60% of the reinforcement products they produce on an annual basis. (See Polymer Injection Technology and Equivalency Protocol explanations in Guidance). The report must contain a summary of the life cycle assessment result for this technology in accordance with the Equivalency Protocol					X													
Confirmation from the Supplier stating, where relevant based on the credit criteria claimed: That they are a responsible steel maker, and listing their compliance documentation. The total quantities (by mass) of structural and/or reinforcing steel supplied to the building.					X													
Bill of Quantities / Report from Quantity Surveyor / Cost Planner / Project Manager or other qualified professional																		X
20.2 Timber	1	1																
1 point is available where at least 95% (by cost) of all timber used in the building and construction works is either: • Certified by a forest certification scheme that meets the GBCA's Essential' criteria for forest certification; or • Is from a reused source.					X	X						X						
Submission Template Completed timber schedule					X	X						X						
Product data sheets						X						X						
Invoices confirming types of timber					X													
Bill of Quantities / Report from Quantity Surveyor / Cost Planner / Project Manager or other qualified professional																		X
20.3 Permanent formwork, pipes, flooring, blinds and cables	1	1			X	X		X	X	X								
1 point is available where 90% (by cost) of all cables, pipes, flooring and blinds in a project either: • Do not contain PVC and have an Environmental Product Declaration (EPD); or • Meet Best Practice Guidelines for PVC.					X	X		X	X	X								
Submission Template Completed PVC schedule					X	X		X	X	X								
Product data sheets					X													
Invoices confirming types of PVC products					X													
Bill of Quantities / Report from Quantity Surveyor / Cost Planner / Project Manager or other qualified professional																		X
21 Sustainable Products	3																	
21.1 Product Transparency and Sustainability					X	X												

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
Up to 3 points are available when product meet transparency and sustainability requirements under one of the following initiatives: A. Reused Products; B. Recycled Content Products; C. Environmental Product Declarations; D. Third-Party Certification; or E. Stewardship Programs. Points are calculated based on specified benchmarks for the percentage of compliant products used in the project. Refer to tab MAT-21 for more detail. Please contact WSP for any additional information.	3	2			X	X												
Completed Sustainable Products Calculator					X	X												
Submission Template •Value of compliant products as calculated in the Sustainable Products Calculator •Description of the sustainable products that are included in project					X													
Confirmation of Project Cost from quantity surveyor or other qualified professional •Confirmation from supplier that products supplied are recycled, recycled content and cost •Product Certification Certificate outlining the environmental credentials of the product •Quantity Surveyors Report or other evidence of cost of certified products •Environmental Product Declarations certificates					X													X
22 Construction and Demolition Waste	1																	
22.1 Reduction of Construction and Demolition Waste					X													
1 point is available where the construction waste going to landfill is reduced either by: A. waste sent to landfill does not exceed 10kg/m² GFA; or B. 90% of waste generated is diverted from landfill Please contact WSP for any additional information.					X													
Submission Template •Details of the Waste Contractor • Weight of waste generated from construction and demolition works •Weight of waste sent to landfill •Where volume to weight conversion is applicable, provide confirmation that the prescribed conversion factors have been used or details of the calculations	1	1			X													
Waste Report - The cumulative waste report must be generated from the monthly waste reports provided by the waste contractor over the entire duration of construction and demolition works. The monthly reports and supporting waste disposal dockets do not need to be included in the credit submission.					X													
Compliance Verification - Summary Compliance verification summaries from waste contractor(s) and waste processing facilities as detailed in the Green Star Construction and Demolition Waste Management Operational and Reporting Criteria - Auditor Verification Guidance document.					X													
Disclosure Statement – from waste contractor(s) outlining how much of the reporting criteria (from the Green Star Construction and Demolition Waste Management Operational and Reporting Criteria - Auditor Verification Guidance document) has been implemented by the Waste Contractor. This statement must also indicate the expected timeline for implementation of at least Part 1 of the Waste Contractors section of the reporting criteria.					X													
LAND USE & ECOLOGY	6																	
23 Ecological Value																		

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
23.0 Endangered, Threatened or Vulnerable Species To be awarded points in this credit, the project must demonstrate that no critically endangered, endangered, or vulnerable species or ecological communities were present on the site at time of purchase. It is a minimum requirement of this credit that a check is carried out to ensure that the site does not contain 'critically endangered, endangered, or vulnerable species or ecological communities as defined in the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).	**Credit CR**	✓		X		X												
Submission Template, including: - Date of site purchase* - Confirmation that no critically endangered, endangered, or vulnerable species or ecological communities were present on the site at time of purchase*				X		X												
DA Approval Report confirming that no vulnerable or endangered species or ecological communities are present on the site				X		X												
23.1 Ecological Value Up to 3 points are awarded where the ecological value of the site is improved by the project. The number of points awarded is determined by the Green Star – Change of Ecological Value Calculator based on a comparison of the condition of the site before and after design/construction.	**3**	**1**				X	X										X	
Submission Template, including: - Description of the site at purchase and as built* - Description of how the ecological value of the site has been improved*						X	X										X	
Site Plans and **Aerial Site Photographs** marked up with land type regions						X	X											
Landscape Drawings and Specifications showing types of planting, hard-standing, waterbodies, etc.						X	X											
24 Sustainable Sites																		
24.0 Conditional Requirement	**Rating CR**	✓		X														
The Conditional Requirement is met when all of the following conditions are satisfied: •The project is not on land containing old-growth forest. •The project is not on prime agricultural land. •The project does not impact on any wetland listed as being 'High National Importance' unless specified Wetland Protection Measures are in place. •The project must not have a significant impact on 'Matters of National Significance' listed under the Environmental Protection and Biodiversity Conservation Act (1999). The GBCA reserves the right to provide the final ruling on a project's compliance with this Conditional Requirement. Projects are required to contact the GBCA if they are unsure if they comply or believe they should not be made subject to the Conditional Requirement				X														
Submission Template •Date of purchase • Description of the site at the time of purchase or date of option contract • Statement of confirmation that the site meets the conditional requirements				X														
Extracts from the Development Application				X														
Zoning Plans				X														
Wetland Management Plan					X													
CV of Ecologist					X													
24.1 Reuse of Land	**1**	**1**				X												
1 point is available where 75% of the site was Previously Developed Land at the date of site purchase or (for previously owned land) at the project's Green Star registration date.						X												
Submission Template • Percentage of the site that was Previously Developed Land at the time of purchase or time of Green Star Registration						X											X	

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As Built Drawings showing the areas that were Previously Developed Land at the time of purchase or Green Star Registration						X												
Aerial Photographs showing the areas that were Previously Developed Land at the time of purchase or Green Star Registration						X												
25. Heat Island Effect																		
25.1 Heat Island Effect Reduction						X											X	
1 point is available if at least 75% of the total project site area comprises: * Landscaping * Roofing materials with 3 year SRI >64 or initial SRI>82 (for roofs with pitch <15°) * Unshaded hardscape with 3 year SRI of >34 or initial SRI>39 * Shaded hardscaping * Water bodies * Areas to the south of the building which are shaded at the summer solstice						X											X	
Submission Template •Summary of how the project meets the credit criteria •Percentage of the site area that meets the requirements of the credit	1	1				X											X	
Site Plan highlighting all relevant areas as referenced within the area schedule						X												
Area Schedule listing the areas of each of the relevant site elements and where relevant, the SRI values and referencing plan drawings for the site (highlighting relevant areas) and supplier documentation						X												
Supplier Documentation. Material data sheet for compliant roofing and hardscape materials highlighting the three year or initial SRI for the product, as applicable					X												X	
EMISSIONS	5																	
26 Stormwater																		
26.1 Reduced Peak Discharge to Sewer						X				X				X				
One (1) point is awarded where project teams demonstrate that the post-development peak event stormwater discharge from the site does not exceed the pre-development peak event stormwater discharge, using the Average Recurrence Interval (ARI) specified: • Where the climate change and adaptation assessment identifies that there is a low risk of increased rainfall and/or flooding during the design life of the project a design ARI of 1 year is required • Where the climate change and adaptation assessment identifies that there is a medium or high risk of increased rainfall and/or flooding during the design life of the project a design ARI of 5 years is required <u>Climate Change Scenarios</u> If the project is targeting the 'Adaptation and Resilience' credit (3), the Risk Assessment included in this credit submission shall be used to determine the appropriate climate change scenario. If the project is not targeting the 'Adaptation and Resilience' credit (3), the project may refer to local council flood level guidance. <u>Rainfall Data for Modelling Programs Using Continuous Simulation</u> The following considerations for rainfall simulation shall be adopted: • Continuous simulation of a minimum of 10 years; • A six (6) minute time step (intervals); • Localised climatic sequences; • Water balances; and • Treatment train operation. <u>Aquifers</u> Discharging stormwater to groundwater systems (aquifer recharge) either directly or indirectly is a legitimate means of achieving compliance with the credit criteria, however it must be ensured that the	1	1												X				

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
Submission Template •Pre- and post-development peak ARI. •Pollution reduction achieved.														X				
Calculation/Modelling Report by a civil engineer, hydraulic engineer or other qualified professional. The report should describe: •Software or calculation methods used. •Data sets and tables that were applied. •Sizing of all stormwater treatment systems installed. •Quantity of stormwater discharge to be addressed by each stormwater treatment system (annually). •If relevant, summarising how hydrocarbons and free oils have been addressed.														X				
Civil/Hydraulics drawings showing the stormwater collection, storage and treatment facilities and detailing their functional elements										X				X				
Hydraulics drawings showing all the capture, storage, piping and discharge route.										X								
Site plans showing the total areas of uncovered areas where vehicles are likely to transit and/or park (e.g. roads, loading docks, refuelling bays, and car parking, etc.).						X												
Independently verified performance certification for each manufactured stormwater treatment device, proving its ability to achieve the Pollution Reduction Targets nominated in Table 26.2 Column A.				X						X				X				
26.2 Reduced Pollution Targets										X				X				
Where criterion 26.1 has been achieved, one (1) additional point is awarded where it is demonstrated that all stormwater discharged from the site meets the Pollution Reduction Targets listed in Column A of Table 26.2 under tab EMI-26.2. In circumstances where this credit specifies levels or targets that are less stringent than those specified in relevant local legislation/regulations, the local legislation/regulations shall take precedence. Where any pollutant types are not relevant to a project, they may be excluded from the criterion requirements. The project team must provide justification as to why the pollutant type should be excluded.	1	1								X				X				
Submission Template •Pre- and post-development peak ARI. •Pollution reduction achieved.														X				
Calculation/Modelling Report by a civil engineer, hydraulic engineer or other qualified professional. The report should describe: •Comparing the results of the pollutant export modelling/calculations with the Pollution Reduction Targets in the relevant column of Table 26.2.										X				X				
27 Light Pollution																		
27.0 Light Pollution to Neighbouring Bodies					X				X									
For the project to be awarded a point for this credit, the project must comply with AS 4282 'Control of the Obtrusive Effects of Outdoor Lighting'. To qualify for points under this credit, project teams must demonstrate that all outdoor lighting on the project complies with AS 4282:1997. The conditions shall be applied to all inhabited boundaries, apart from boundaries with roads. **Exclusion(s)** Signage related to emergency exits and external emergency lighting that only illuminates in the event of an emergency/power failure are excluded from the requirements of this credit. Lighting related to other safety requirements are also excluded, for example, the lighting of ATMs. External emergency lighting that is integrated into the general external lighting scheme must comply with the requirements of the credit. For example, lights that act as general lighting but have a battery pack to ensure that they also stay on in the event of a power failure must comply.	Credit CR	✓			X				X									

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
Submission Template •Description of how the credit criteria have been met •Confirmation that the lighting has been designed in accordance with AS 4282									X									
27.1 Light Pollution to Night Sky					X				X									
1 point is available where it can be demonstrated that a specified reduction in light pollution has been achieved by the project. Two options are available for demonstrating a reduction in light pollution. ***27.1A Control of Upward Light Output Ratio (ULOR)*** To achieve this credit, the project team must demonstrate that no external luminaire on the project has an ULOR that exceeds 5%, relative to its actual mounted orientation ***27.1B Control of Direct Illuminance*** To achieve this credit, the project team must demonstrate that direct illuminance from external luminaries on the project produces a maximum initial point illuminance value no greater than: - 0.5 Lux to the site boundary, and - 0.1 Lux to 4.5 meters beyond the site into the night sky. when modelled using a calculation plane set at the highest point in the building.					X				X									
Submission Template •Description of how the credit criteria have been met •Confirmation that the lighting has been designed in accordance with AS 4282 •Confirmation that the no external luminaire has an Upward Light Output Ratio that exceeds 5%; •Confirmation that Direct illuminance from external luminaries produces a maximum initial point illuminance value no greater than 0.5 Lux to the site boundary and no greater than 0.1 Lux to 4.5 metres beyond the site into the night sky	1	1			X				X									
As Built drawings indicating the location of all external luminaires and showing the aiming point and mounting orientation of all external Lumina									X									
Luminaire schedule for all external lighting, nominating the type, lighting distribution and quantity of each luminaire and including the relevant photometric data showing that the luminaires do not have an upward light output ratio that exceeds 5%									X									
Calculation Plots for all external lighting, showing that all grid points on the calculation plane return a maximum reading of 0.5 Lux to the site boundary and no greater than 0.1 Lux to 4.5m beyond the site into the night sky.									X									
29 Refrigerant Impacts																		
29.1 Refrigerant Impacts								X										
1 point is awarded where: The combined Total System Direct Environmental Impact (TSDEI) of the refrigerant systems in the building is less than 15; OR The combined Total System Direct Environment Impact (TSDEI) of the refrigerant systems is between 15 and 35, AND a leak detection system is in place; OR All refrigerants in the project have ozone depletion potential of zero, and a global warming potential of 10 or less; OR Where there are no refrigerants employed by nominated building systems, this point is awarded.								X										
29.1.1 Leak Detection Systems In order for the leak detection system requirements to be met, any refrigeration equipment with a cooling capacity above 50kW is fitted with an automated leak detection system, in accordance with Section 4.8 and Appendix G of AS/NZS 1677:2:1998, Refrigerating Systems - Safety Requirements for Fixed Applications								X										

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
29.1.2 Low-Impact Refrigerants Where all refrigerants in the project have an ODP value of 0, and a GWP value of less than 10, the credit will be awarded. At the time of this writing, the refrigerants that are deemed compliant are: water, carbon dioxide, hydrofluoroclefins (R1234), propane, pentane, butane, propylene, ethane or isopropane	1	1						X										
29.1.3 No Refrigeration Equipment 1 point is awarded where no refrigeration equipment is present in the project								X										
Submission Template • List of nominated systems to be included in the credit clearly outlining refrigeration equipment • Summary of the building commissioning plan, clearly outlining refrigeration equipment. • Confirmation that the building commissioning has taken place according to the plan.								X										
Completed Impacts from Refrigerants Calculator								X										
Extract(s) from the Commissioning Report demonstrating that comprehensive precommissioning activities and commissioning activities have been performed as outlined in the Compliance Requirements. The relevant sections must be highlighted.								X										
Refrigeration System Data Sheets outlining system attributes including refrigeration type, capacity, charge rate and other data required for the Impacts from Refrigerants Calculator.								X										
INNOVATION	10																	
30 INNOVATION																		
Innovation																		
Up to 10 points may be awarded where it has been demonstrated that an innovative sustainability design, process or advocacy initiative has been implemented under any of the following categories. Unless indicated elsewhere, each initiative will be awarded one point.																		
30A Innovative technology or process: The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.		2							X								X	
30B Market transformation: The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.																		
30C Improving on Green Star benchmarks: The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark required to achieve full points. For credits where this innovation credit criterion is applicable, improved benchmarks are included in the 'Guidance' section of the credit.																		
30D Innovation Challenge: Where the project addresses a sustainability issue not included within any of the Credits in the existing Green Star rating tools, projects may propose a new Innovation Challenge. Alternatively, the project can use an existing Innovation Challenge that is published on the GBCA website	10	8		X	X	X											X	
30E Global Sustainability: Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is currently outside the scope of this Green Star rating tools. A list of approved credits is published on the GBCA website.																		

Credit Compliance	Points Available	Points Targeted	Due Date / Status	Building Owner - UoN	Head Contractor	Architect	Landscape Architect	Mechanical Engineer	Electrical Engineer	Hydraulic Engineer	Fire Protection Engineer	Structural Engineer	Façade consultant	Civil Engineer	Acoustic Consultant	ICA	ESD Consultant - WSP	Quantity Surveyor
		75.4																

APPENDIX D

POTABLE WATER CALCULATOR

Weighted Points Achieved	5

Links to - Building and climate data:	Building input, areas and operation	10-year rainfall data			
Links to - Water demand:	Fittings	Whitegoods	Heat Rejection	Washdown	Landscape Irrigation
	Swimming pools	Fire Protection System	Process Cooling		
Links to - Reclaimed water supply:	Reclaimed water use	Rainwater collection	Greywater collection	Blackwater collection	Stormwater and off-site reclaimed water supply
Links to - Results:	Checklist	Demand summary	Results for Performance Pathway (18A) only	Results for Domestic hot water	Results for Sewerage

Instructions: **Enter information into light blue cells**

For details on what information is required and how this information is used to calculate the reduction in potable water consumption against the Standard Practice Benchmark, please refer to the Green Star - Potable Water Calculator Guide, available from the GBCA website.

0. GENERAL

BUILDING OCCUPANCY, AREAS AND OPERATION

Space type description	Area (m²)	Peak days of operation (remaining days assumed off-peak)	Occupancy profile	Maximum design occupancy used in water use: Proposed Building design occupancy (m2/person)	Maximum design occupancy used in water use: Default design occupancy (Not applicable for residential areas)	Percentage of building users who occupy the space continually for periods greater than one hour.
Ground	492.5	5 days a week	NCC Table 2b (Class 5, Class 8 or Class 9a)	4.925	Please select	100%
Level 1	513.1	5 days a week	NCC Table 2b (Class 5, Class 8 or Class 9a)	4.664545455	Please select	100%
Level 2	565	5 days a week	NCC Table 2b (Class 5, Class 8 or Class 9a)	6.010638298	Please select	100%
Level 3	603.9	5 days a week	NCC Table 2b (Class 5, Class 8 or Class 9a)	3.704907975	Please select	100%
Mezzanine	30.7	5 days a week	NCC Table 2b (Class 5, Class 8 or Class 9a)	3.704907975	Please select	100%
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
Non occupied areas		n/a	n/a			
TOTAL AREA	2205.2					

BUILDING CHECKLIST

Please provide responses to the following questions. Detailed inputs will be requested further on in the calculator.

WATER USES - ALL QUESTIONS MUST BE ANSWERED

1. Sanitation

Are fixtures and fittings provided for building occupant sanitation?	**Yes**
Does the project provide for sports activities?	**No**
Have showers been installed for post/pre activity use?	**No**

5. Landscape Irrigation

Are there any landscaped areas within the project?	**Yes**
Are any irrigation systems included in the project?	**No**

6. Swimming Pools

2. White Goods	
Does the project include any dishwashers or washing machines?	**Yes**

3. Heat Rejection	
Does the project utilise water based heat rejection (building cooling)?	**Yes**
Does the project have cooling towers?	**Yes**
Does the project contain any other water cooled systems that are not conventional cooling towers?	**No**

4. Wash Down	
Does the project include wash down areas?	**No**

Are there any swimming pools within the project?	**No**

7. Fire Protection System	
Does the project include a fire protection system?	**Yes**

8. Process Cooling	
Does the project include any water based process cooling?	**No**

WATER REUSE - ALL QUESTIONS MUST BE ANSWERED

9. Water Reclamation	
Does any water collection, reclamation and/or reuse occur on the project site?	**Yes**
Does the project include rainwater capture and reuse systems?	**Yes**
Does the project include greywater capture, treatment and reuse systems?	**No**
Does the project include blackwater capture, treatment and reuse systems?	**No**
Does the project include other stormwater reuse or an off-site supply of non-potable water?	**No**

1. SANITATION FIXTURE EFFICENCY

WATER DEMAND FROM FIXTURES AND FITTINGS: (Annual water demand from fixtures and fittings is calculated using assumed usage rates based on the space types and occupancies entered above. Please see pages 10-13 of the Gree

	Water efficiency		**Resulting water efficiency used in calculator (l/min, except for toilets, L/flush)**	**Percentage of each type**	**Proposed Building water demand (kL/year)**	**Standard Practice Building water demand (kL/year)**
	Manual entry from manufacturer's data sheet (l/min, or L/flush for toilets)	**WELS Star Rating selection**				
Toilets						
All Toilets		4 Star	3.5	100%		

(The Standard Practice

			Total	100%	563.8	644.4	Benchmark is based on 3 StarWELS rated toilets)

Urinals	**Are urinals installed?**	Yes	**Would urinals normally be installed in the building type?**	Yes	(Note: if "No" is selected, the project team should provide justification within the short report as to why the standard practice building does not have urinals.)
All Urinals		6 Star	1	100%	

Urinals on auto timer	**Enter average L/flush**						
	Enter number of urinals on autotimer						
	Percentage of total number of Urinals						
			Total	100%	123.9	247.8	(The Standard Practice Benchmark is based on 3 Star WELS rated urinals)

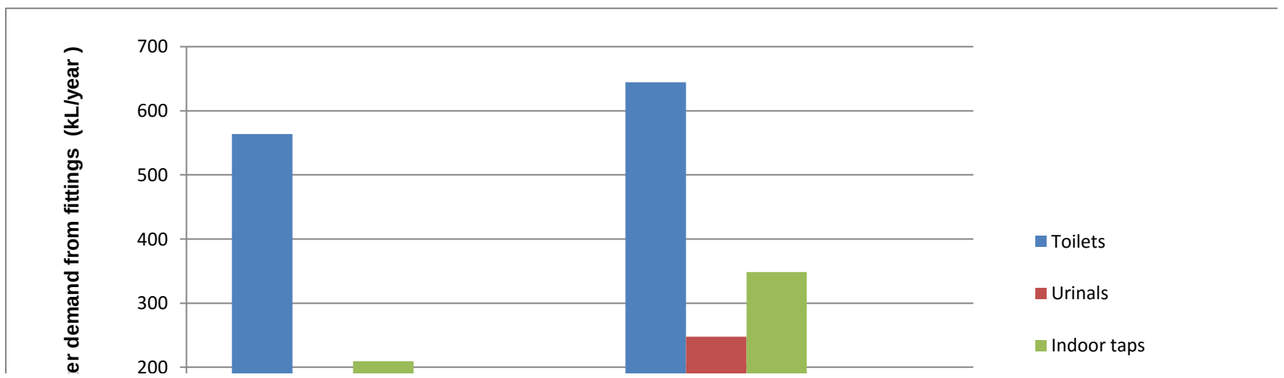
Indoor taps							
All taps		6 Star	4.5	100%			
			Total	100%	209.1	348.5	(The Standard Practice Benchmark is based on 4 Star WELS rated taps)

	Shower demand by occupants (reference)		0.0%		For residential buildings Enter 100% for both "reference" and "current" shower demand
Showers - Occupants	**Shower demand by occupants (current)**		0.0%		For other building Types Use the reference and proposed building bicycle accommodation percentage from the Sustainable Transport Calculator, or percentages determined under 17.B.4 'Active Transport Facilities' criterion to determine the number of building occupants that are likely to shower each day.
			Total	0%	0.0	0.0	(The Standard Practice Benchmark is based on 3 Star WELS rated showers)
				Please ensure the total equals 100%			

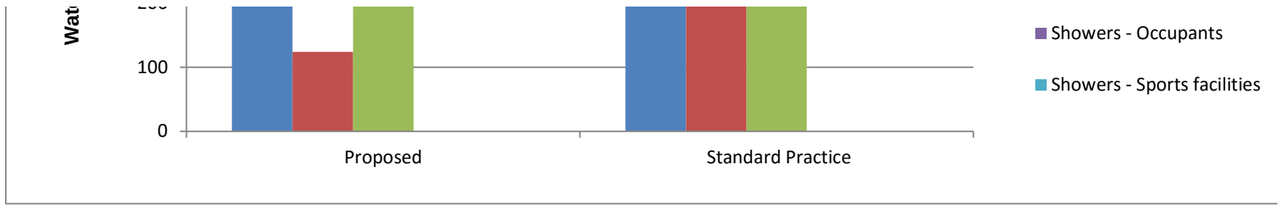
	Indicate the number of people expected to participate in sporting activities each day. (Use an average based on weekly figures if required)			Indicate the number of days/year that the sports facilities are in use	
Showers - Sports facilities					
			Total	0%	0.0	0.0	(The Standard Practice Benchmark is based on 3 Star WELS rated showers)
				Please ensure the total equals 100%			

RESULTS: WATER DEMAND FROM FITTINGS

	Proposed Building water demand (kL/year)	Standard Practice Building water demand (kL/year)
Toilets	563.8	644.4
Urinals	123.9	247.8
Indoor taps	209.1	348.5
Showers - Occupants	0.0	0.0
Showers - Sports facilities	0.0	0.0



TOTAL	896.8	1240.7



2. WHITE GOODS

Water Demand from Washing Machines

The project team is to provide documentary evidence in accordance with the water calculator guide and technical manual to substantiate the number of

Clothes washing machines	Water efficiency: Manual entry from manufacturer's data sheet	Water efficiency: WELS Star Rating selection	Machine capacity (kg)	Resulting water efficiency used in calculator (L/kg)	Number of each type	Number of cycles per year (leave blank if unknown)	Proportion of water per cycle that is sourced from DHW (%)
				Total	0		

Water Demand from Dishwashers

Dishwashers	Water efficiency: Manual entry from manufacturer's data sheet	Water efficiency: WELS Star Rating selection	Machine capacity (number of place settings)	Resulting water efficiency used in calculator (L/cycle)	Number of each type	Number of cycles per year (leave blank if unknown)	Proportion of water per cycle that is sourced from DHW (%)
All Dishwashers		5 Star	12	10.1	2		
				Total	2		

3. HEAT REJECTION

This section requires outputs from the energy simulation undertaken for Conditional Requirement and Greenhouse Gas Emissions (Credit 15).

GENERAL INFORMATION

Site elevation (m above sea level)	1.5
Maximum combined cooling tower air flow (L/s)	10,713
Peak building cooling load (kW)	458

Standard Practice Building HVAC system	
Select one of the following building types:	Non-residential > 2,300m2 and less than 1,000 kWr total cooling capacity
Standard Practice HVAC system type assumed for Energy and Water Category	System type 2: Air cooled chillers

Maximum combined cooling tower air flow (L/s)	10712.67
Peak building cooling load (kW)	480

Water Demand from Cooling Towers

The Standard Practice Building is assumed to install no water cooled systems.
No further information is required for the Standard Practice Building.

Enter the total monthly cooling load (in kWh) for all zones in the project conditioned with systems that use cooling towers below. Cooling load from zones which are naturally ventilated or conditioned by air-cooled systems should not be included in this figure

Data required for calculation of EVAPORATION:

Inputs	Proposed Building monthly cooling load (kWh/month)	Average dry bulb temperature (°C)	Average relative humidity (%)	Standard Practice Building monthly cooling load (kWh/month)
January	52,551	29	66	53120.4
February	39,768	28	69	38059.1
March	38,170	26	68	36541.7
April	23,409	24	67	22715.2
May	10,099	20	68	10040.6
June	3,669	18	68	3619.9
July	1,859	17	66	1207
August	3,477	19	62	2477.7
September	9,685	22	63	8643.5
October	21,481	24	61	20822.3
November	23,324	26	64	22616.5
December	37,690	28	63	36216.1

Visit the Bureau of Meteorology's website to obtain average dry bulb and relative humidity data relevant to your site:
http://www.bom.gov.au/climate/data/index.shtml?bookmark=200

Data required for calculation of DRIFT:

	Proposed Building	Standard Practice Building	
Condenser Water Δt (°C)	5.5	5.5	(as per the requirements of the Greenhouse Gas Emissions Calculator Guide)
Drift coefficient (%)	0.000%	0.00002	(as required in AS3666.1 clause 4.4)

Data required for calculation of BLEED:

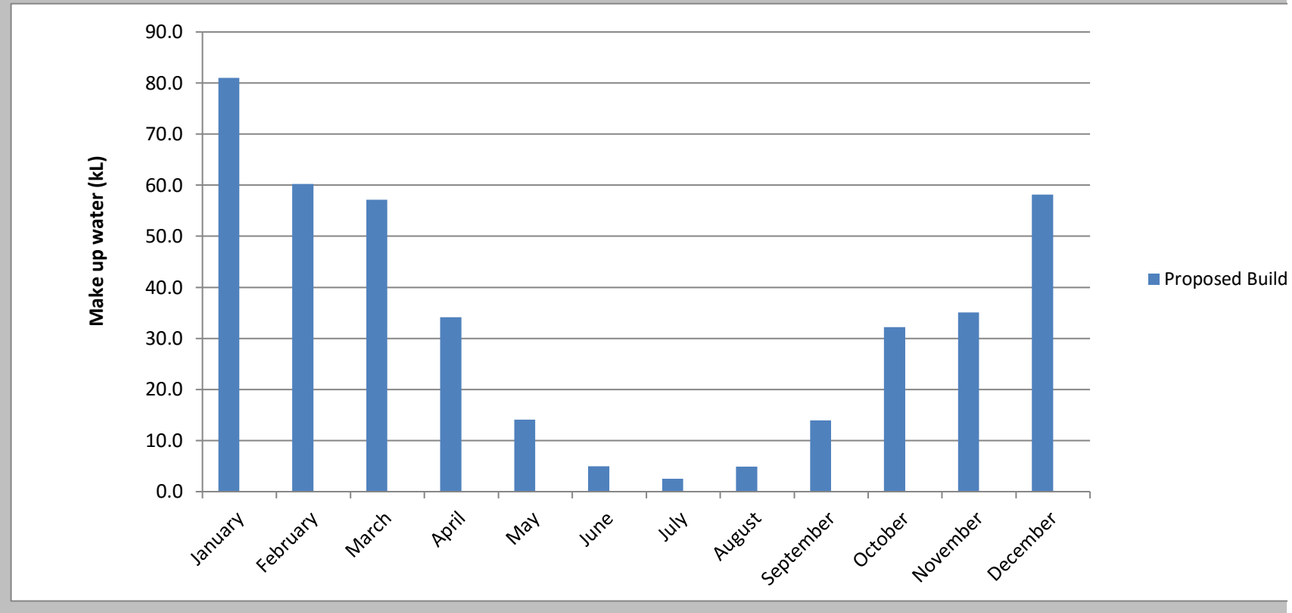
	Proposed building	Standard Practice Building	
Cycles of concentration	6	6	Standard practice cycles of concentration

	Proposed Building				Standard Practice Building			
	Evaporation (kL)	Drift (kL)	Bleed (kL)	TOTAL kL/month	Evaporation (kL)	Drift (kL)	Bleed (kL)	TOTAL kL/month
January	67.53	0.00	13.51	81.04	0.00	0.00	0.00	0.00
February	50.19	0.00	10.04	60.23	0.00	0.00	0.00	0.00
March	47.62	0.00	9.52	57.14	0.00	0.00	0.00	0.00
April	28.48	0.00	5.70	34.17	0.00	0.00	0.00	0.00
May	11.73	0.00	2.35	14.08	0.00	0.00	0.00	0.00
June	4.13	0.00	0.83	4.95	0.00	0.00	0.00	0.00
July	2.09	0.00	0.42	2.51	0.00	0.00	0.00	0.00
August	4.06	0.00	0.81	4.87	0.00	0.00	0.00	0.00
September	11.64	0.00	2.33	13.97	0.00	0.00	0.00	0.00

October	26.81	0.00	5.36	32.18	0.00	0.00	0.00	0.00
November	29.25	0.00	5.85	35.10	0.00	0.00	0.00	0.00
December	48.47	0.00	9.69	58.16	0.00	0.00	0.00	0.00
TOTAL (L/year)	332.00	0.01	66.40	**398.41**	0.00	0.00	0.00	0.00

Water demand from heat rejection systems that are not conventional cooling towers

THE PROJECT TEAM HAS INDICATED THAT THERE ARE NO WATER BASED HEAT REJECTIC COOLING TOWERS INCLUDED IN THE PROJECT, PLEASE PROCEED T



4. WASHDOWN

THE PROJECT TEAM HAS INDICATED THAT WASHDOWN AREAS ARE NOT INCLUDED IN THE PROJECT, PLEASE PROCEED TO THE NEXT SE

5. LANDSCAPE IRRIGATION

(The irrigation requirement for the site is calculated for each month of the year, for each landscaped 'zone' in the site (a zone being a landscaped area that has the same soil type, irrigation system and as far as possible, types of plants). Please see pages 17-22 of the Green Star- Calculator Guide for further details.)

Climate data	Monthly rainfall (mm)	Monthly evapotranspiration (point potential) (mm)
January	107.7	203.2
February	114.2	176.58
March	92.5	132.53
April	116.9	126.04
May	161.3	105.9
June	74.1	77.55
July	85.1	103.29
August	97.2	119.15
September	59.6	162.91
October	82.9	172.12
November	85.2	179.76
December	51.1	208.83

Data on each landscaped zone				Irrigation system water application efficiency	
Zone name and description	Area of zone (m^2)	Percentage of zone undercover (%)	Weighted average crop coefficient in zone	Default water application efficiency for common irrigation systems	User determined application efficiency
General	66	0%	0.25	Hand watering (50%)	
				Please select	
				Please select	
				Please select	
				Please select	
				Please select	
				Please select	
				Please select	
				Please select	
				Please select	
Standard practice landscape irrigation assumptions:	(Same as Proposed Building)	(Same as Proposed Building)	(0.6)	(75%)	

RESULTS: WATER DEMAND FROM IRRIGATION

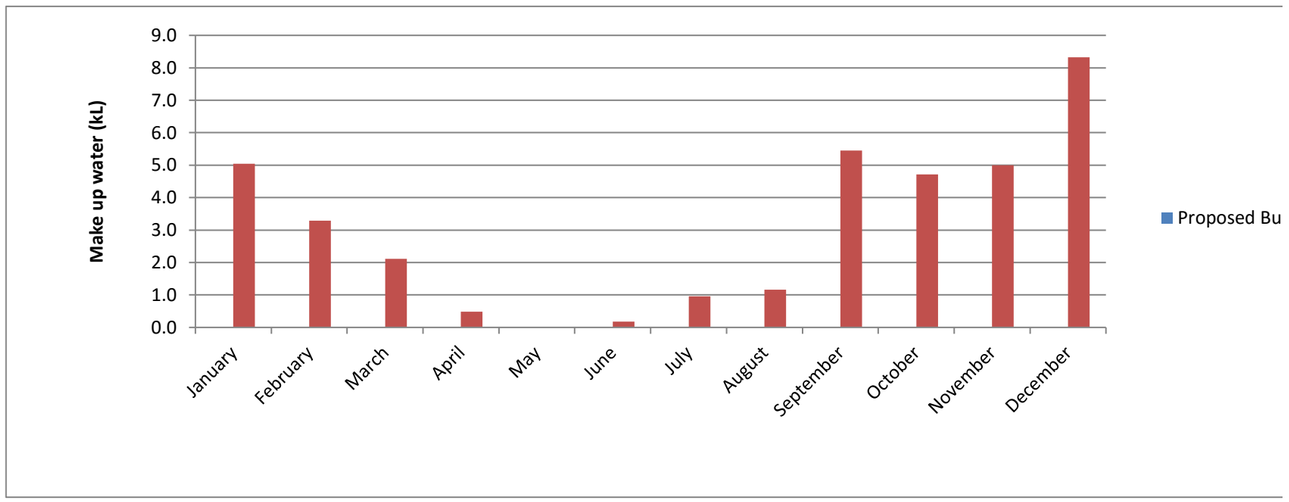
Annual irrigation requirement from each zone

	Annual irrigation requirement for each zone (kL/year)	
Zone name and description	**Proposed Building**	**Standard Practice Building**
General	0.0	36.7
0	0.0	0.0
0	0.0	0.0
0	0.0	0.0
0	0.0	0.0
0	0.0	0.0
0	0.0	0.0
0	0.0	0.0
0	0.0	0.0
0	0.0	0.0
TOTAL for all zones (kL/year)	**0.0**	**36.7**

Note: The irrigation requirement for a particular zone will only be computed once every field related to that zone has been completed in the table above.

Total irrigation requirement for all zones by month

	Irrigation requirement for all zones per month (kL/month)	
	Proposed Building	**Standard Practice Building**
January	0.0	5.0
February	0.0	3.3
March	0.0	2.1
April	0.0	0.5
May	0.0	0.0
June	0.0	0.2
July	0.0	1.0
August	0.0	1.2
September	0.0	5.5
October	0.0	4.7
November	0.0	5.0
December	0.0	8.3
Total make up water (kL/year)	**3.5**	**36.7**



6. SWIMMING POOLS

THE PROJECT TEAM HAS INDICATED THAT THERE ARE NO SWIMMING POOLS IN THE PROJECT, PLEASE PROCEED TO T

7. FIRE PROTECTION SYSTEMS

Is the building required under part E of the National Construction	Yes
Does the building's sprinkler system discharge water during	Yes
Is greater than 80% of discharged water captured for reuse?	Yes
Testing frequency (enter number of tests per year)	4
Volume discharged per test (L)	
Proportion of water captured per test (%)	100%
Fire protection system water point achieved	Yes

8. PROCESS COOLING

THE PROJECT TEAM HAS INDICATED THAT THERE IS NO PROCESS COOLING IN THE PROJECT, PLEASE PROCEED TO T

9. RECLAIMED WATER

Note: All systems entered into this calculator must comply with local EPA requirements.

Reclaimed Water Use

How are the water demands from uses assessed in Potable Water credit met?

Water use (assessed in Potable Water, Credit 18)	Percentage of fittings/systems connected to the following water sources				
	Rainwater	Greywater	Blackwater	Stormwater recycling or other off-site reclaimed water	Mains water only (this column must be completed - please enter a figure of between 0% and 100% for each water use)
Toilets	100%				
Urinals	100%				
Indoor Taps					100%
Showers - occupants					
Showers - sports					
Laundries					
Dishwashers					
Heat rejection					
Wash down					
Landscape irrigation	100%				
Fire system water					
Swimming pools					
Process cooling					

Note: Where fittings or systems are supplied with water from more than one source, it is assumed that the they are first supplied with water from any greywater and blackwater systems, followed by rainwater, stormwater and off-site reclaimed water systems.

Total monthly water demands from water uses not assessed in the Potable Water credit (kL) whose demands are completely or partially met by reclaimed water:

Note: The demand for reclaimed water from water uses assessed under other credits will be met before any water uses assessed under the Potable Water Credit.

	Monthly water demand (kL/month)		
	<Enter description of any other uses of rainwater or re-used water>	**<Enter description of any other uses of rainwater or re-used water>**	**<Enter description of any other uses of rainwater or re-used water>**
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

Note: This table only needs to be filled in if reclaimed water is used to meet the demand of these end uses.

If reclaimed water is not used for these end uses, leave these cells blank.

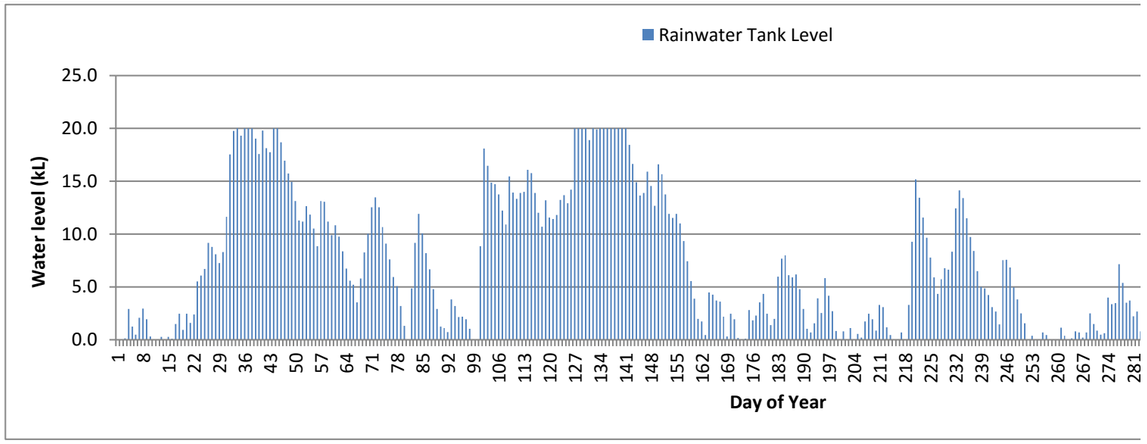
When reclaimed water is used, enter the total demand for each month regardless of whether it is fully or partially met by the reclaimed water supply. In the table below, the percentage of the demand met by reclaimed water/connected to the reclaimed water supply is entered.

How are the water demands from the Non-Potable water uses met?

Water use	Rainwater	Greywater	Blackwater	Stormwater recycling or other off-site reclaimed water	Mains water only (this column must be completed - please enter a figure of between 0% and 100% for each water use)
<Enter description of any other uses of rainwater or re-used water>					
<Enter description of any other uses of rainwater or re-used water>					
<Enter description of any other uses of rainwater or re-used water>					

Rainwater Collection

Rainfall collection area (m2)		657.2
Run-off co-efficient	Pitched roof with profiled metal sheeting	0.9
Storage capacity (kL)		20
Rainwater tank reliability %		77%



Grey Water Collection

THE PROJECT TEAM HAS INDICATED THAT NO GREYWATER COLLECTION IS INCLUDED IN THE PROJECT, PLEASE PROCEED TO THE NEXT SECTION.

Black Water Collection THE PROJECT TEAM HAS INDICATED THAT NO BLACKWATER COLLECTION IS INCLUDED IN THE PROJECT, PLEASE PROCEED TO THE NEXT SECTION.

Black Water Collection THE PROJECT TEAM HAS INDICATED THAT NO BLACKWATER COLLECTION IS INCLUDED IN THE PROJECT, PLEASE PROCEED TO THE NEXT SECTION.

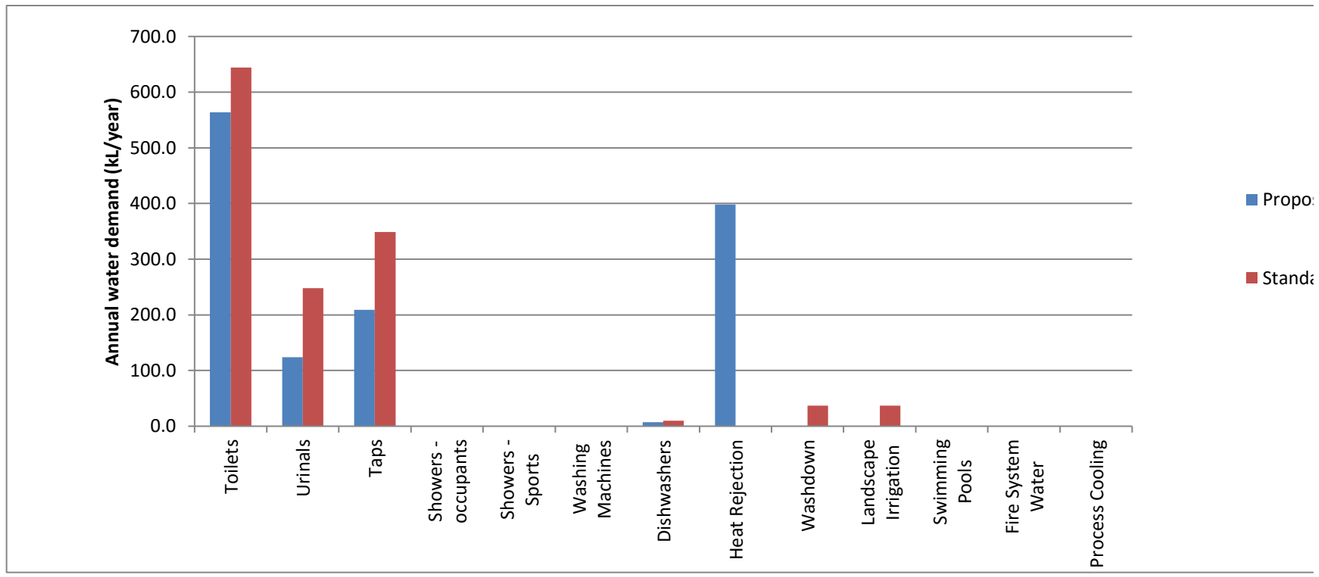
Stormwater and Off-site reclaimed water supply **THE PROJECT TEAM HAS INDICATED THAT NO STORMWATER OR OFFSITE COLLECTION IS INCLUDED IN THE PROJECT, PLEASE PROCEED**

9. SUMMARY OF WATER DEMAND

Summary of demand from each Potable water use

Annual water demand from each Potable water use (kL/year)

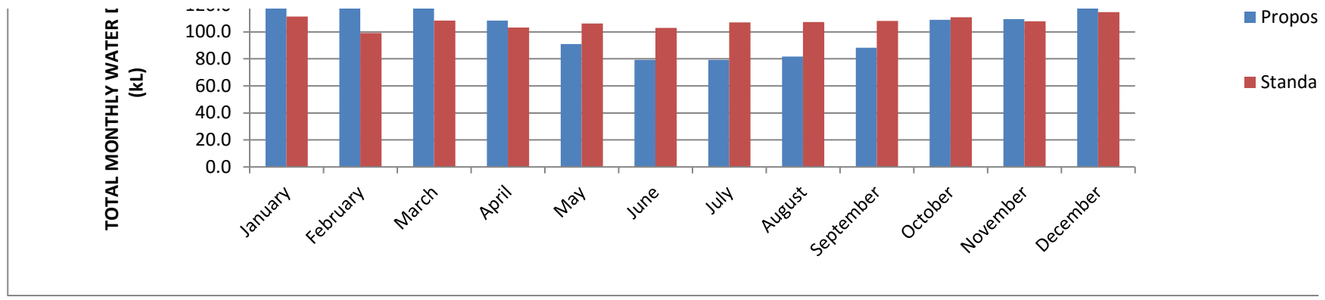
	Proposed Building	Standard Practice Building
Toilets	563.8	644.4
Urinals	123.9	247.8
Taps	209.1	348.5
Showers - occupants	0.0	0.0
Showers - Sports	0.0	0.0
Washing Machines	0.0	0.0
Dishwashers	7.3	9.8
Heat Rejection	398.4	0.0
Washdown	0.0	36.7
Landscape Irrigation	0.0	36.7
Swimming Pools	0.0	0.0
Fire System Water	0.0	0.0
Process Cooling	0.0	0.0
TOTAL	1,302.6	1,323.9



Summary of demand from all Potable water uses per month

	Monthly water demand from all Potable water uses (kL/month)	
	Proposed Building	Standard Practice Building
January	157.8	111.2

February	129.6	99.2
March	133.9	108.3
April	108.5	103.3
May	90.9	106.2
June	79.3	103.0
July	79.3	107.2
August	81.7	107.4
September	88.3	108.2
October	109.0	110.9
November	109.4	107.8
December	135.0	114.5
TOTAL	1,302.6	1,323.9



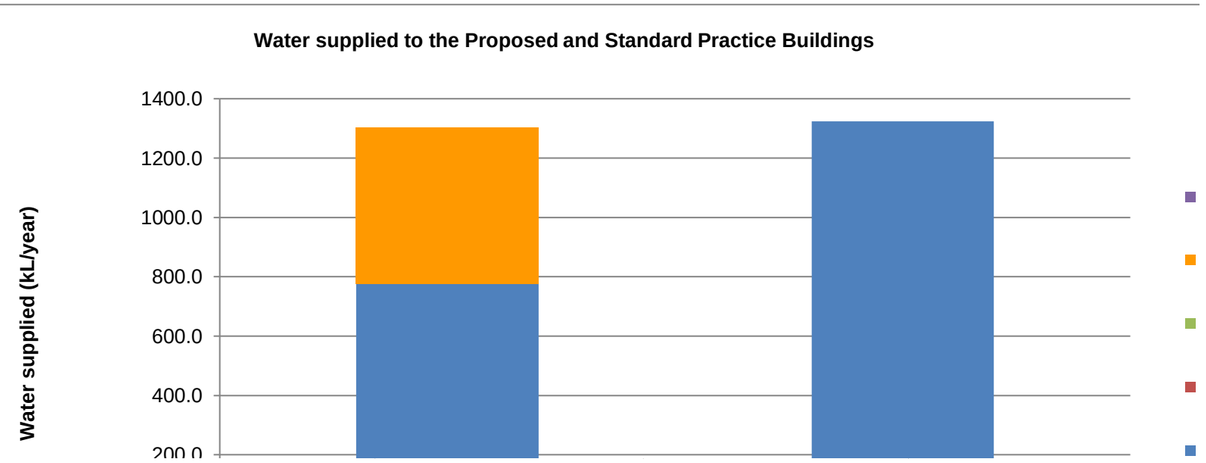
10. RESULTS

	Proposed Building						Standard Practice Building
	Total water demand	Rainwater used to meet demand	Greywater used to meet demand	Blackwater used to meet demand	Stormwater and off-site reclaimed water used	**Potable water demand**	**Potable water demand**
January	158	37	0	0	0	121	**111**
February	130	53	0	0	0	77	**99**
March	134	55	0	0	0	79	**108**
April	108	50	0	0	0	59	**103**
May	91	58	0	0	0	32	**106**
June	79	47	0	0	0	32	**103**
July	79	43	0	0	0	36	**107**
August	82	49	0	0	0	32	**107**
September	88	25	0	0	0	63	**108**
October	109	42	0	0	0	67	**111**
November	109	42	0	0	0	68	**108**
December	135	24	0	0	0	111	**115**
TOTAL	**1,303**	**527**	**0**	**0**	**0**	**776**	**1,287**

Percentage reduction in Potable Water Consumption compared to the Standard Practice Building	40%

Points Achieved - General	**4**
Points Achieved - Fire system test water	**1**
Points Achieved - Process cooling	**N/A**

Points Allocation		
Percentage reduction compared to standard practice benchmark	kL/year	Points awarded
0%	1287	0
5%	1223	1



15%	1094	2
25%	965	3
35%	837	4
45%	708	6
55%	579	7
65%	451	8
75%	322	9
85%	193	10
95%	64	11

	Proposed Building	Standard Practice Building
Stormwater/ other reclaimed water	0.0	0.0
Rainwater	526.6	0.0
Blackwater	0.0	0.0
Greywater	0.0	0.0
Potable water (mains)	776.0	1323.9

Outputs from this calculator required for Ene-Conditional Requirement and Credit 15: Greenhouse Gas Emissions.

The annual domestic hot water usage figures determined in this calculator must be used in the energy modelling required for Ene-Conditional Requirement and Credit 15: Greenhouse Gas Emissions to estimate the domestic hot water energy requireme Standard Practice Buildings. For more details see the Green Star - Greenhouse Gas Emissions Calculator Guide, available www.gbca.org.au.

The estimates of annual hot water consumption usage of the Proposed Building are based on the water efficiency of the fittings entered into this calculator. The estimates for the Standard Practice Building are based on the Standard Practice Building's fittings - for further details see the Green Star - Potable Water Calculator Guide, available www.gbca.org.au.

	Proposed Building	**Standard Practice Building**
Annual Domestic Hot Water Usage (kL/year)	104.55	174.25

NOTE: THESE FIGURES CAN ONLY BE USED IF the 'Building input, areas and operation' and 'Water consumption due to fittings' sections of THIS CALCULATOR are COMPLETED.

11. SEWAGE

SEWERAGE REDUCTION DUE TO WATER RECYCLING

Percentage reduction in discharge to sewer compared to	-1.2%
Innovation Point Achieved	**0**

An innovation point may be claimed for a 90% of greater reduction in flow to sewer

RAINFALL DATA

The project team is to paste daily average rainfall data for their location into the following table. The project team may supply their own data (see Potable Water calculator guide) or may copy and paste the provided data for preselected locations as shown to the right).

Location	
Date	**10-Year Average (mm)**
1-Jan	0.0
2-Jan	0.8
3-Jan	5.5
4-Jan	0.9
5-Jan	1.4
6-Jan	4.1
7-Jan	5.2
8-Jan	2.0
9-Jan	1.0
10-Jan	0.5
11-Jan	0.0
12-Jan	1.0
13-Jan	0.0
14-Jan	1.0

15-Jan	0.7
16-Jan	3.1
17-Jan	4.7
18-Jan	1.2
19-Jan	4.7
20-Jan	2.3
21-Jan	4.6
22-Jan	9.0
23-Jan	4.7
24-Jan	4.8
25-Jan	7.9
26-Jan	3.1
27-Jan	2.6
28-Jan	2.3
29-Jan	5.5
30-Jan	9.4
31-Jan	13.7
1-Feb	7.5
2-Feb	7.6
3-Feb	2.6
4-Feb	6.5
5-Feb	13.3
6-Feb	6.6
7-Feb	2.1
8-Feb	1.3
9-Feb	7.5
10-Feb	0.9
11-Feb	3.1
12-Feb	9.9
13-Feb	6.3
14-Feb	1.5
15-Feb	0.8
16-Feb	1.7
17-Feb	2.4
18-Feb	0.7
19-Feb	0.6
20-Feb	3.6
21-Feb	6.2
22-Feb	2.4
23-Feb	1.5
24-Feb	0.9
25-Feb	11.0
26-Feb	3.6
27-Feb	0.5
28-Feb	1.6
1-Mar	5.3
2-Mar	1.9
3-Mar	1.4
4-Mar	1.0
5-Mar	1.8
6-Mar	3.1
7-Mar	0.9
8-Mar	7.6
9-Mar	7.9
10-Mar	6.7
11-Mar	8.0
12-Mar	5.3
13-Mar	2.2
14-Mar	0.0

15-Mar	1.1
16-Mar	1.2
17-Mar	0.9
18-Mar	2.3
19-Mar	0.0
20-Mar	0.0
21-Mar	0.6
22-Mar	8.8
23-Mar	11.0
24-Mar	8.4
25-Mar	0.6
26-Mar	0.0
27-Mar	1.2
28-Mar	0.0
29-Mar	0.0
30-Mar	0.9
31-Mar	2.4
1-Apr	1.8
2-Apr	7.0
3-Apr	2.7
4-Apr	2.0
5-Apr	3.8
6-Apr	3.3
7-Apr	2.2
8-Apr	0.5
9-Apr	0.0
10-Apr	15.5
11-Apr	19.4
12-Apr	1.0
13-Apr	1.0
14-Apr	3.5
15-Apr	2.1
16-Apr	1.2
17-Apr	1.5
18-Apr	11.4
19-Apr	1.2
20-Apr	2.7
21-Apr	4.7
22-Apr	3.9
23-Apr	7.3
24-Apr	3.2
25-Apr	0.0
26-Apr	0.0
27-Apr	1.5
28-Apr	8.0
29-Apr	1.0
30-Apr	3.5
1-May	4.4
2-May	6.1
3-May	4.5
4-May	2.5
5-May	5.9
6-May	17.9
7-May	5.1
8-May	3.7
9-May	5.9
10-May	1.9
11-May	8.6
12-May	3.6

13-May	3.9
14-May	7.2
15-May	9.0
16-May	6.8
17-May	8.7
18-May	6.2
19-May	15.5
20-May	4.4
21-May	1.1
22-May	0.7
23-May	0.8
24-May	1.6
25-May	4.2
26-May	7.1
27-May	1.5
28-May	0.0

APPENDIX E

PV SYSTEM PANEL TYPE

LG
Life's Good

LG PRODUCT WARRANTY
25 YEAR

15 YEARS LONGER THAN INDUSTRY STANDARD OF 10 YEARS

LG NeON® R

LG365 Q1C-A5

THE STAR PERFORMER

UP TO 21.1% MODULE EFFICIENCY

365 is the highest wattage 60 cell panel in Australia*

Awards Received By LG Solar™

EUPD RESEARCH TOP BRAND PV MODULES AUSTRALIA 2019
EUPD RESEARCH TOP BRAND PV MODULES AUSTRALIA 2018
EUPD RESEARCH TOP BRAND PV MODULES AUSTRALIA 2017
EUPD RESEARCH TOP BRAND PV MODULES AUSTRALIA 2016
inter solar award 2016 WINNER
inter solar award 2015 WINNER
inter solar award 2013 WINNER

THE NeON® R - 365W - A SOLAR MILESTONE FOR LG

The LG NeON® R is the ideal panel for solar systems seeking visually pleasing looks, for roofs where space is tight and for customers seeking a larger than standard system on their roof. The LG NeON® R reaches an incredible 365W with a 21.1% efficiency. Similar physical size competing 60 cell panels in Australia and New Zealand produce 270W power at 15.9% efficiency.

The NeON R is also the right panel when future solar system expansion is considered or as a combo install of panels and solar energy storage via batteries as well as electric vehicle charging. The LG NeON® R is the most powerful panel in the LG module range. The 30 multi ribbon busbars at the rear of the module is the result of LGs extensive solar R&D investment.

Great Visual Appearance

LG NeON® R panels have been designed with appearance in mind. Their black cells, black frames and no metal solders or wires on the front of the panel give an aesthetically pleasing uniform black appearance. Your home deserves the LG NeON® R.

25 Years Product Warranty (Parts & Labour)

The LG product warranty on the NeON R is 15 years longer than many competitors 10 years and covers 25 years. The warranty is provided by LG Electronics Australia and New Zealand. The warranty includes replacement labour and transport.

More Power per Square Metre

LG NeON® R's 365W are a similar physical size to many competing 270W panels. This means with the LG NeON® R 365W you get 40.3% more electricity per square metre than a 270W panel. So you can install more kW of solar on your roof with the LG NeON® R.

Improved 25 Year Performance Warranty

The NeON® R has a better 25 year performance warranty than many of panels on the Australian market. It will still achieve 88.4% of rated output after 25 years, compared to 80.2% for many competing panels. The annual degradation rate after first year is 0.4% compared to 0.7% for many competing panels.

*As at January 2019

Made in Korea

www.lgenergy.com.au

LG365Q1C-A5

LG NeON® R

ABOUT LG ELECTRONICS

LG Electronics embarked on a solar energy research programme in 1985, using our vast experience in semi-conductors, chemistry and electronics. In 2010, LG Solar successfully released its first Mono X® series, and LG Solar modules are now available in over 50 countries. In 2013, 2015 and 2016 the LG NeON® range won the acclaimed Intersolar Award in Germany, which demonstrates LG Solar's lead in innovation and commitment to the renewable energy industry. With over 200 lesser known brands panels selling in Australia, LG solar panels offer a peace of mind solution, as they are backed up by an established global brand.

KEY FEATURES

Proven Field Performance

LG has been involved in a number of comparison tests of the LG panels against many other brand panels and performed very well. The LG NeON® R is LG Solar's most efficient and highest output panel range.

Corrosion Resistance Certifications

LG NeON® R panels can be installed confidently right up to the coastline. The panels have received certifications for Salt Mist Corrosion to maximum severity 6 and Ammonia Resistance.

Strict Quality Control Reliable for the Future

The quality control of LG world-class solar production is monitored and improved using Six Sigma techniques via 500+ monitoring points to effectively maintain and improve our uncompromising quality.

Multi Anti-reflective Coatings Increase Output

LG is using an anti-reflective coating on the NeON® R glass as well as on the cell surface to ensure more light is absorbed in the panel and not reflected. More absorbed light means more electricity generation.

Improved High Temperature Performance

Solar panels slowly lose ability to generate power as they get hotter. LG NeON® R, has an improved temperature co-efficient to many competing modules, which means in hot weather LG NeON® R panels will deliver higher electricity output.

Heading: Multi–Ribbons Increases Power

The NeON® R 30 multi-ribbon busbar technology hidden at the rear of the module, under the backing sheet, lowers electrical resistance and increases panel efficiency, giving more power per panel and provides a more uniform look to the panel.

Low LID

The N-type doping of the NeON® cells results in extremely low Light Induced Degradation (LID) when compared with the standard P-type cells. This means more electricity generation over the life of the panel.

Extensive Testing Programme

LG solar panels are tested between 2 to 3 times the International Standards at our in-house testing laboratories, ensuring a very robust and longer lasting solar module.

Wind Load Resistance

LG modules have a strong double walled frame. When it comes to wind forces (rear load) many competitor modules are certified to 2400 Pascals.

Positive Tolerance (0/+3%)

If we sell you a 365 Watt panel then the flash test of this panel will show somewhere between 365W and 376W. Some competitor panels have -/+ tolerance, so you could get a flash test result below the rated Watt, meaning you pay for Watts you never get.

Anti PID Technology for Yield Security

PID (Potential Induced Degradation) affects the long term ability of panels to produce high level electricity output. LG panels have anti PID technology and have been successfully tested by leading third party laboratories regarding PID resistance.

Automated Production in South Korea

All LG solar panels are manufactured in a custom designed and fully automated production line by LG in Gumi, South Korea ensuring extremely low tolerances. This means great quality and build consistency between panels.

LG NeON® R – QUALITY & HIGH EFFICIENCY IS OUR PASSION.

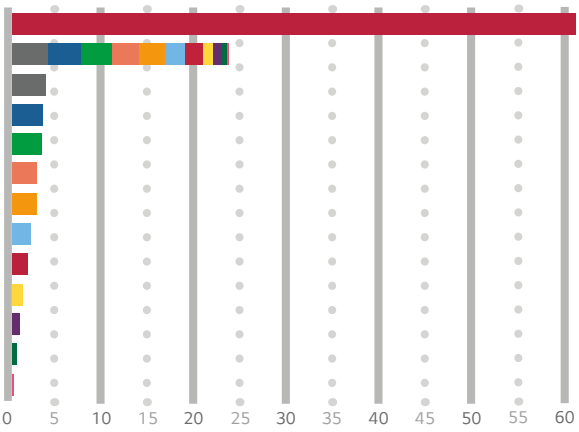
The NeON® R is LG's most efficient solar module range. Featuring an innovative design which allows an up to 35.1% more electricity per m^2 than many competing 270W panels , it can also withstand a higher wind load than many competing panels. The 25 year product warranty is 15 years longer than many panels on offer and its linear performance guarantee has been improved to 88.4% of nominal output after 25 years. This is 6.8% more output guaranteed at year 25, than many competing panels on the market.

LOCAL WARRANTY, GLOBAL STRENGTH

LG Solar is part of LG Electronics Inc., a global and financially strong company, with over 50 years of experience in technology.

Good to know: LG Electronics Australia Pty Ltd is the warrantor in Australia and NZ for your solar modules. So LG support, via offices in every Australian mainland state and NZ and through our 70 strong, Australia wide dealer network, is only a phone call away.

The Warrantor's 2017 Global Sales in Billions of US Dollars

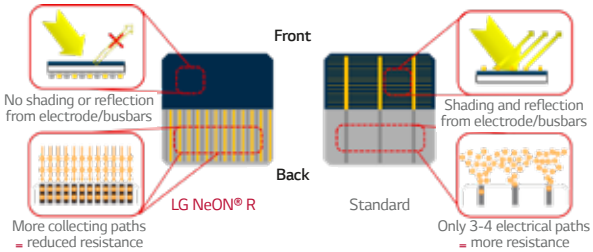


LG Electronics	$61.4bn
All below combined	$23.7bn
Jinko Solar*	$3.9bn
Trina Solar*	$3.5bn
Canadian Solar*	$3.4bn
First Solar*	$2.9bn
JA Solar*	$2.9bn
Hanwha Q Cells*	$2.2bn
Sunpower*	$1.9bn
Yingli*	$1.2bn
Suntech*	$0.9bn
REC Solar*	$0.6bn
Winaico/Win Win Precision Tech*	$0.15bn

*2017 Annual Financial Statements.

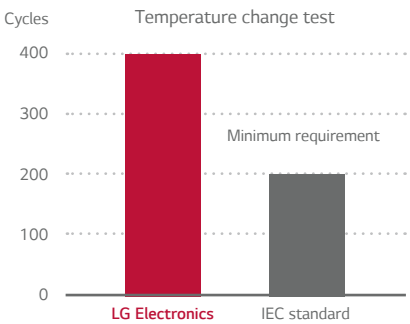
HIGHER OUTPUT, HIGHER YIELD

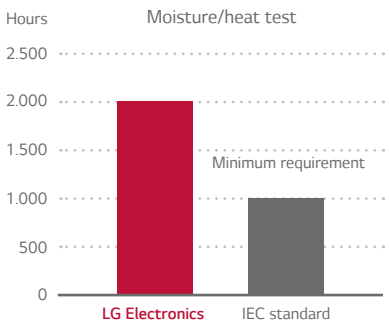
The NeON® R module range has moved the busbars to the rear of the module, allowing a bigger front cell surface to be exposed to light and therefore generating more electricity. With 30 multi-ribbon busbars on the rear, compared to 3 or 4 by many competing panels (at the front), LG has moved solar panel design forward, via this innovative approach, and increasing panel output as a result.



EXCELLENT QUALITY, THOROUGHLY TESTED

You can rely on LG. We test our products with at least double the intensity specified in the IEC standard. (International Quality Solar Standard).



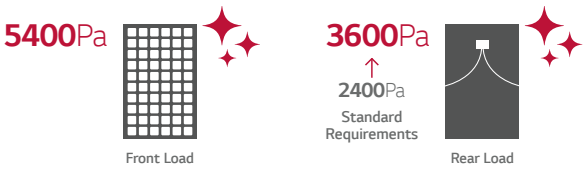


Awards Received By LG Solar™

Our panel range have won a string of International Awards.

POWERFUL DESIGN, GUARANTEED ROBUST

With reinforced frame design, the LG NeON® R can endure a front load of 5400 Pa which is the equivalent of 1048 kg in weight over the size of the module. The rear load/wind load of the module is 3600 Pa which is more than the wind load resistance of many competing modules (2400 Pa).



LG offers a 15 year longer product warranty for parts and labour than many competitors 10 years to an impressive 25 years.

10yrs +15yrs

LG365Q1C-A5

LG NeON® R

Mechanical Properties

Cells	6 x 10
Cell Vendor	LG
Cell Type	Monocrystalline / N-type
Cell Dimensions	161.7 x 161.7 mm
Cell Colour	Black/Blue (Similar to Pantone PMS 5004)
# of Busbar	30 (Multi Ribbon Busbar)
Dimensions (L x W x H)	1700 x 1016 x 40 mm
Front Load	5400 Pa
Rear Load	3600 Pa
Weight	18.5 kg
Connector Type	Genuine MC4, IP68 (Male: PV-KST4) (Female: PV-KBT4)
Junction Box	IP68 with 3 bypass diodes
Length of Cables	2 x 1000 mm
Front cover	High transmission tempered glass
Frame	Anodised aluminum with protective black coating

Certifications and Warranty

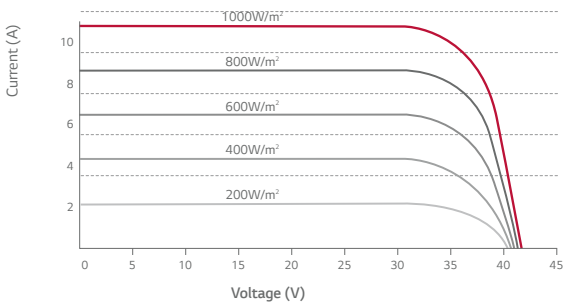
Certifications	ISO 9001, ISO 14001, ISO 50001
	IEC 61215-1/-1-1/2:2016, IEC 61730-1/-2:2016, UL1703
	OHSAS 1001, PV CYCLE
	IEC 61701:2012 Severity 6 (Salt Mist Corrosion Test)
	IEC 62716:2013 (Ammonia Test)
Module Fire Rating	Class C (UL 790, ULC/ORD C 1703)
Product Warranty	25 Years
Output Warranty of Pmax (Measurement Tolerance ± 3%)	Linear Warranty[1]

[1] 1) After first year: 98%, 2) After second year: 0.4% annual degradation, 3) 25 years: 88.4%

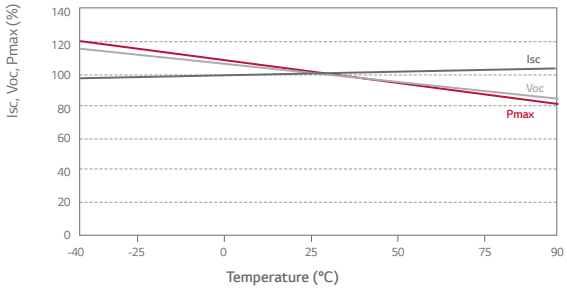
Temperature Characteristics

NOCT	44 ± 3 °C
Pmax	-0.30 %/°C
Voc	-0.24 %/°C
Isc	0.037 %/°C

Current – Voltage characteristics at various irradiance levels



Current – Voltage characteristics at various cell temperatures



Electrical Properties (STC[2])

Module Type	365 W
Maximum Power Pmax (W)	365
MPP Voltage Vmpp (V)	36.7
MPP Current Impp (A)	9.95
Open Circuit Voltage Voc (V)	42.8
Short Circuit Current Isc (A)	10.80
Module Efficiency (%)	21.1
Operating Temperature (°C)	-40 ~ +90
Maximum System Voltage (V)	1000
Maximum Series Fuse Rating (A)	20
Power Tolerance (%)	0 ~ +3

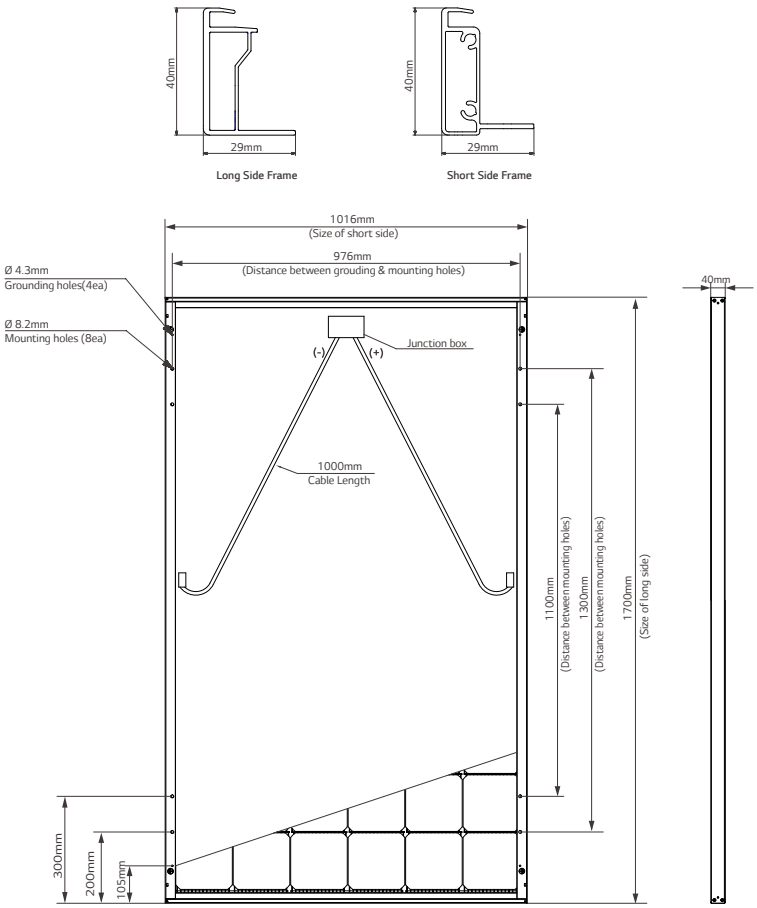
[2] STC (Standard Test Condition): Irradiance 1000 W/m², Module Temperature 25 °C, AM 1.5.
The nameplate power output is measured and determined by LG Electronics at its sole and absolute discretion.

Electrical Properties (NMOT[3])

Module Type	365 W
Maximum Power Pmax (W)	275
MPP Voltage Vmpp (V)	36.6
MPP Current Impp (A)	7.51
Open Circuit Voltage Voc (V)	40.2
Short Circuit Current Isc (A)	8.70

[3] NMOT (Nominal Module Operating Temperature): Irradiance 800 W/m², ambient temperature 20 °C, wind speed 1 m/s, Spectrum AM 1.5.

Dimensions (mm)



LG Life's Good

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Solar Business Division
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www.lg.com/global/business

Product specifications are subject to change without prior notice.
Date: 01/2019

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